PROCEEDINGS

Sixty-Fifth Annual Convention
OF THE
American Railway Bridge & Building Association
1960

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Proceedings of the

Sixty-Fifth Annual Convention

of the

American Railway
Bridge & Building
Association

Held at

CHICAGO, ILLINOIS

September 19-21, 1960

Published by the Association
Ruth Weggeberg, Secretary
220 So. Michigan Ave., Chicago 4

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OFFICERS FOR 1960

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Baltimore & Ohio, Garrett, Ind.

G. W. Benson ..... Second Vice-President
Central of Georgia, Macon, Ga.

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St. Louis Southwestern, Tyler, Tex.

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Past President

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H. M. Wilson, Pennsylvania ..... Chicago, Ill.

Past President

B. M. Stephens, Texas & New Orleans ..... Houston, Tex.

PROCEEDINGS

The Event—The 65th Annual Convention of the Bridge & Building Association
The Time—September 19-21, 1960
The Place—The Conrad Hilton Hotel, Chicago

The 1960 convention of the Bridge and Building Association was held, as usual, concurrently with, although separately from, the Roadmasters' and Maintenance of Way Association. Attendance at the two conventions, which did not feature an exhibit, totaled 1184, including 538 railroad men, 186 supply men and 460 guests.

These proceedings give excerpts from the major addresses delivered during the joint sessions of the convention and the reports of the five subjects committees and abstracts of the two special features which were presented during the separate sesssions of the B&B Association. In addition, the proceedings include the directory of members, the constitution and by-laws and other pertinent current and historical information.

Joint Sessions

Two joint sessions were held during the convention, the first on Monday morning, September 19, and the second the following morning. The joint session on Monday was the opening session of the convention and featured addresses by B. F. Biaggini, vice president of the Southern Pacific and G. M. Leilich, vice president, operations, of the Western Maryland.

The second joint session featured addresses by H. C. Murphy, president of the Chicago, Burlington & Quincy and J. Handley Wright, vice president of the Public Relations Department, Association of American Railroads. In addition, Frank R. Woolford, chief engineer of the Western Pacific, gave an illustrated talk on his recent tour of Russia's railroads and railroad facilities.

B&B Separate Sessions

President B. M. Stephens presided at the separate sessions of the Bridge and Building Association. During these sessions the following committee reports were presented:

Outfit Cars Versus Highway Trailers for B&B Living Quarters
Automatic Heating Plants
Bridge Inspection Procedures by B&B Forces
Application of Prestressed Concrete to Buildings and Bridges
Annual Programming of B&B Work

On Tuesday afternoon John D. Keane, director of research, Steel Structures Painting Council, gave an illustrated address entitled "New and Improved Paint Systems for Steel Structures." The following morning J. W. N. Mays, assistant engineer — structures, Pennsylvania, addressed the B&B session. He related, with the aid of motion pictures, the progress of the PRR towards mechanizing its bridge and building forces.

Remarks by President Stephens

According to the By-Laws of the American Railway Bridge and Building Association, there is a specific schedule to be followed in conducting the annual meeting of the association. We have now reached the item of this schedule that calls for an address by the president of the association. Therefore, I shall attempt to perform accordingly.

Sixty-nine years ago, almost to the day, your association came into being. The first meeting was at St. Louis and there was a total of 60 members listed on the roster of the association. During the next 40 years, annual meetings were held at various cities in the United States and Canada and the membership grew from a total of 60 in the birth year of 1891 to a peak total of 865 members in 1922.

Because of economic conditions, there were no annual meetings in 1931, 1932, and 1933 and, due to those economic conditions, mem-

PRESIDENT B. M. STEPHENS presided over separate sessions of B&B Assn.

bership had dropped to a total of 592 at the time of the 41st annual meeting in 1934. Since that time, however, our membership has steadily increased to the total of 932 which will go into the record book as the membership for the 65th annual meeting we are holding this week.

The complexion of our active membership and distribution of it over the country is varied. We have representatives of all phases of railroading, except that of purchasing, the two largest groups being composed of those in bridge and building supervisory service—52%—and in engineering and architectural service—41%. Approximately 2% of the members are in the executive and operating departments and the remaining 5% is composed of those in water service, track, scale, and work equipment departments.

Our active members reside in every state in the union, except Hawaii, Rhode Island, and Vermont. The State of Illinois leads the list with 113 members and my own state of Texas is second with 55 members. A total of 5 members live in the District of Columbia and 23 members reside in Canada. Chicago is headquarters for by far the larger number of our members, 86 of them working in the "Windy City." Runner-up position is held by St. Louis as headquarters for 21 members.

Our association was founded by a relatively small group of men dedicated to the goal of developing ways and means of improving conditions. The object of our association—and I quote from our constitution—"shall be the advancement of knowledge pertaining to the design, construction, and maintenance of railway bridges, buildings, water service facilities, and other structures by investigations, reports, and discussions."

We have come a long, long way since 1891 and we can be justly proud of our accomplishments. Yet, our task is far from being completed. Conditions of today are just as challenging—and I think you will agree, more complex—as they were 69 years ago. We must continue to be alert, to adopt new conceptions and ways and means of doing things, to respond willingly to communications from officers above us, to keep the channels of communication open for both upward and downward flow, to eliminate wasteful practices at every turn, to see every tree as well as the forest. Only by these means can our great industry continue to go forward and meet the challenges of competition in the transportation field.

Your association has a part to play in all of this—since the association serves as a clearing house for ideas, brings together those with common interests and goals, provides meetings wherein exchanges of thoughts and experiences can take place through open discussions of problems and situations.

New Committee Subjects

The new subjects selected for study by the association's new committees are as follows:

1. Protection and Preservation of Bridge Decks and Timber Trestles
2. Inventory Reduction by Local Purchase and Delivery to Job Site by Local Supplier
3. Simplifying Accounting Methods and Work Reports
4. Modern Tools and Equipment for B&B Gangs
5. Selection and Application of Roofing Materials

Each committee will report its findings and conclusions to the 1961 convention.

In the election of officers, H. D. Curie, master carpenter, B&O, Garret, Ind., was promoted from first vice president to president; G. W. Benson, division engineer, C of Ga., Macon, Ga., was advanced from second vice president to first vice president; J. M. Lowry, chief engineer, SLSW, Tyler, Tex., was moved up from third vice president to second vice president; and E. R. Schlaf, assistant superintendent water service, IC, Chicago, was elected third vice president. L. C. Winkelhaus, retired architectural engineer, C&NW, Chicago, was re-elected treasurer.

New directors elected for three-year terms are Shirley White, general bridge and building supervisor, Southern Pacific, San Francisco, Calif., and H. M. Wilson, supervisor structures, Pennsylvania, Chicago.

TREASURER'S REPORT

SEPTEMBER 1, 1959 TO AUGUST 31, 1960

Cash Balance—September 1, 1959		$2,848.06
RECEIPTS:		
Dues	$3,604.50	
Advertising:		
1958 Proceedings	125.00	
1959 Proceedings	1,795.00	5,524.50
Total Receipts		$8,372.56
DISBURSEMENTS:		
Salaries (Secretary and Assistant)	$1,581.53	
Social Security and Withholding Tax	395.23	
Stationery and Printing	661.40	
Postage	228.00	
Office Rent, Telephone, Electricty	233.80	
Proceedings (1959 Edition)	2,522.91	
1959 Convention Expenses	587.22	
Office Supplies	29.21	
Addressograph Plates	37.20	
Embossing Membership Certificates	71.35	
Miscellaneous	87.68	
Moving Expenses	26.15	6,461.68
Cash on Hand—August 31, 1960		$1,910.88
BALANCE:		
First National Bank of Chicago, August 31, 1960	$4,308.79	
Less outstanding check	2,397.91	$1,910.88

L. C. WINKELHAUS, Treasurer

September 10, 1960
APPROVED:
W. H. BUNGE, *Chairman*
R. E. DOVE
R. P. LUCK
E. R. SCHLAF
Auditing Committee

REPORT OF AUDITING COMMITTEE

TO MEMBERS OF THE
AMERICAN RAILWAY BRIDGE & BUILDING ASSOCIATION:

Gentlemen:

The undersigned have examined the books of the Secretary and report of the Treasurer for the period from September 1, 1959, to August 31, 1960, inclusive, and have found them to be correct as of the latter date.

Respectfully submitted,
W. H. BUNGE, *Chairman*
E. R. SCHLAF
R. P. LUCK
R. E. DOVE
Auditing Committee

September 10, 1960—rsw

SECRETARY'S REPORT

ANNUAL REPORT OF MEMBERSHIP FOR PERIOD SEPTEMBER 15, 1959 TO SEPTEMBER 15, 1960

ACTIVE MEMBERSHIP:			
Total Active Members, September 15, 1959		671	
Reinstated—Paid back dues		6	
New Active Members Since September 15, 1959		86	
Life Member Transferred to Active Membership		1	
		764	
LESS—Members reported deceased	7		
Resigned account retirement, etc.	17		
Transferred to Life Membership	12		
Dropped for non-payment of dues	26	62	
TOTAL ACTIVE MEMBERS, SEPTEMBER 15, 1960			702
ASSOCIATE MEMBERS:			
Total Associate Members, September 15, 1959		96	
New Associate Members since September 15, 1959		47	
Reinstated—Paid back dues		2	
		145	
LESS—Members reported deceased	1		
Resigned account of retirement, etc.	8		
Transferred to Life Membership	2		
Dropped for non-payment of dues	6	17	
TOTAL ASSOCIATE MEMBERS, SEPTEMBER 15, 1960			128
LIFE MEMBERS:			
Total Life Members, September 15, 1959		88	
Transferred from Active Membership		14	
		102	
LESS—Reported deceased	6		
Life member returned to Active Membership	1	7	
TOTAL LIFE MEMBERS, SEPTEMBER 15, 1960			95
HONORARY MEMBERS:			
Total Honorary Members, September 15, 1959		8	
LESS—Honorary Member Deceased		1	
TOTAL HONORARY MEMBERS, SEPTEMBER 15, 1960			7
TOTAL MEMBERSHIP—All Classes—September 15, 1960			932

September 16, 1960—rsw

REPORT OF NECROLOGY COMMITTEE

(1959-1960)

We regret to advise that we have learned of the loss of fourteen (14) members through death during the year. It is possible that other members have passed away during the year of whom we have no information. If you know of any, we would like to have their names to include in the list to be printed in the Annual Proceedings. The following have been reported since our last annual meeting in September, 1959:

NAME *Active Members*	TITLE-RAILROAD	DATE JOINED	DATE DIED
R. E. Baker	Asst. B&B Supvr. Monon Bloomington, Ind.	1959	February, 1960
F. S. Cheselski	Asst. Supvr. B&B Great Northern Grand Forks, N. D.	1956	In 1960

J. A. Hobson	Asst. Water Serv. For. St. Louis-San Francisco Amory, Miss.	1957	In 1959
A. E. Hotard	Asst. Br. Eng. Louisville & Nashville Louisville, Ky.	1953	January 4, 1960
P. D. Miesenhelder	Conc. Engr., Res. Staff AAR Chicago, Ill.	1952	In 1960
T. V. Pyle	Eng. of Design Elgin, Joliet & Eastern Joliet, Ill.	1954	In 1960
W. A. Sweet	Gen. For. B&B Atch., Topeka & Santa Fe Newton, Kan.	1928	In 1959
C. H. Buford (Ret.)	President Milwaukee Road St. Petersburg, Fla.	1946	August, 1960
Life Members			
W. A. Clark (Ret.)	Office Engineer Dul., Mis. & Iron Range Duluth, Minn.	1908	March 13, 1959
C. E. Miller (Ret.)	Asst. Engr. M/W Chicago & North West. Highland Park, Ill.	1916	March 31, 1960
E. Patenaude (Ret.)	B&B Master Canadian Pacific Sturgeon Falls, Ont.	1930	In 1959
T. W. Pinard (Ret.)	Chief Engineer Long Island Bellport, L. I., N. Y.	1920	January 25, 1960
R. E. Wait (Ret.)	Supvr. B&B Wabash Decatur, Ill.	1923	In 1960
Axel Wiitala (Ret.)	Gen. For. B&B Lake Sup. & Ish. Marquette, Mich.	1941	February, 1960
Associate Members			
W. J. Corriveau	Admin. Asst. Linde Co. Oxweld RR Dept. Chicago, Ill.	1960	July 1, 1960

We deeply regret the passing of these, our fellow members.

Respectfully submitted,
R. C. Baker, *Chairman*
Necrology Committee

REPORT OF RESOLUTIONS COMMITTEE

The 65th year of the American Railway Bridge & Building Association is nearing the end of a very successful convention, and a very large registration.

Our principal speakers were outstanding and therefore it is fitting that we recognize the special efforts of all who contributed so much to make this a memorable year.

To this, we propose the following resolution:

BE IT RESOLVED by the American Railway Bridge & Building Association in convention assembled that the thanks of the Association be extended first to Dr. Kenneth Hildebrand, Pastor of the Central Church of Chicago, who invoked the blessing and guidance on the activities of the combined Associations and guests.

BE IT FURTHER RESOLVED, That the thanks of the Association be extended to the Executive officers who honored us with inspiring remarks and counsel, especially to Mr. H. C. Murphy, President, Burlington Lines, and to Mr. B. F. Biaggini, Vice-presi-

dent, Southern Pacific Company; and to Mr. G. M. Leilich, Vice-President Operations, Western Maryland Railroad, and to Mr. J. H. Wright, Vice President, Public Relations, Association of American Railroads.

BE IT FURTHER RESOLVED, That the sincere thanks of the Association be extended to Mr. F. R. Woolford, Chief Engineer, Western Pacific.

BE IT FURTHER RESOLVED, That the thanks of the Association be extended to E. J. Brown, President, American Railway Engineering Association; to Mr. Leo J. Flinn, President of Association of Track and Structure Suppliers; to Mr. Ray T. Johnson, First Vice President, Association of Track and Structure Suppliers and to the Conrad Hilton Hotel and staff for splendid cooperation and hospitality shown us during this Convention.

BE IT FURTHER RESOLVED, That the thanks of the Association be extended to the Chairman and members of each report who has contributed so much to the success of this Convention, and to our President, Mr. B. M. Stephens, who has so efficiently directed our activities during this convention year.

H. A. Matthews, *Chairman*

New and Improved Paint Systems for Steel Structures

JOHN D. KEANE
Steel Structures Painting Council

On Tuesday afternoon, September 20, John D. Keane, director of research for the Steel Structures Painting Council, gave an illustrated address before the B&B separate session. Speaking on "New and Improved Paint Systems for Steel Structures," he had the following comments to make:

Nearly all paints are made up of five basic components, the oil, resin, pigment (including extenders), thinners and driers or catalysts.

Oil base paints are designated as SSPC Paint System No. 1. Judging from extensive panel and field testing, treated linseed oil paints appear to be among the very best for ordinary atmospheric exposure or for very mild marine exposures. This system is particularly useful where a hand cleaned surface must be used. The oil coatings are noted for their fair resistance to weather and ultraviolet light, their adequate elasticity, good ease of application, excellent surface wetting properties and low cost. As to disadvantages, these paints are poor in water resistance, poor in abrasion resistance, and poor in chemical environment.

Grease paints have been used in a variety of environments with mixed results. These coatings have low initial cost and are good for easy application, especially in inaccessible spots. They are intended for temporary protection in mild areas.

Alkyds, Paint System No. 2, are traditionally formed by reacting phthalic anhydride with glycerine and oil in a varnish kettle. The amount of oil may be increased or decreased to emphasize such characteristics as higher resistance and faster drying (less oil) or better wetting power (more oil). These paints, except for those with very long oil, require very careful surface preparation—commercial sand blasting or the equivalent. The alkyds are used for weather exposure, high humidity, and infrequent immersion.

Phenolic paint systems — designated as Paint System No. 3—are recommended for fresh water immersion, for alternate immersion, for high humidity, condensation and weather exposure. As in alkyds, the variation in types of resins and oil length produce different characteristics, the shorter oil length giving better water and chemical resistance but being more brittle.

Vinyl paints are used for chemical exposures or salt water, for water immersion, high humidity, and condensation and for weather exposure. Vinyls ordinarily require sand blasting as a minimum surface preparation and for inhibitive vinyl primers, the minimum systems calls for sand blasting plus a wash

primer. Vinyls have afforded some of the best protection to date on a water tank test where the water level is repeatedly raised and lowered.

Bituminous coatings, an important class, are covered in SSPC Paint System No. 8. The standard here is one thick coat of cold applied asphalt mastic which is suitable for chemical atmospheric exposure but not for underground. As an alternative, various coal tar mastics filled or unfilled, asphalt emulsion and coal tar emulsions are specified. Emulsions have considerable thickness, low permeability, and relative inertness which gives them a good resistance to water and fumes. Commercial sand blasting is required and normally followed by a coal primer.

Epoxy paints are a versatile family of resin paints that give good film flexibility, hardness, toughness, adhesion, and high solids. A catalyst is ordinarily added to epoxy resin paints at the last minute in order to achieve hardening without baking. Alternatively, an air-drying epoxy is reached by modifying it with oil. This, however, sacrifices some of its chemical and brine resistant characteristics.

Coal tar epoxies are essentially a combination of the coal tar and the epoxy discussed previously. They carry some of the advantages of each coating, providing a wide range of combinations, and showing quite a bit of promise.

Chlorinated rubber coatings are made by exposing natural rubber to chlorine gas until you have about 67% chlorine. This is a hard brittle resin which has to be plasticized with other resins or with linseed oil or alkyds. When placticizers and alkyds are added for flexibility and adherence, however, less brine and chemical resistance is derived from the coating.

Neoprene coatings are based on the use of synthetic rubber. There are two kinds of Neoprene—the high solids product having poor adhesions and the low solids product with better adhesion.

Pigmentation

The solids pigment of a paint formulation not only provides the aesthetic function of color and hiding, but it is absolutely necessary for its protective qualities. The pigment shields the film from weather and ultra-violet light; it provides a barrier to the passage of water and oxygen, both of which are necessary for corrosion, and it provides rust inhibitive properties. This rust inhibitive property is a distinctive feature of the various structural steel primers. Red lead is one example. While the working mechanism differs in the various primers, in general, the pigment deposits an insoluble compound at any point on the steel where there is incipient rusting. Thus it stifles corrosion by plugging any weak spots in the natural oxide film on the surface of the metal.

Red lead, perhaps the best known inhibitive pigment, is alkaline, forms a good film, is oxidizing and highly inhibitive. It is expensive and dense, however, and must be topcoated.

Basic lead silico chromate is a composite pigment made up by surrounding a silica extender with an inhibitive basic lead chromate thus combining the inhibitive properties of the chromate with the bulk and lower cost of the other.

Zinc dust pigment protects steel by a "sacrificial action." When moisture and oxygen penetrate a paint film, tiny electric cells are set up in which the zinc is used up while the steel remains intact. The zinc must constitute over 85% of the paint weight in order for the film to be electrically conductive and, therefore, effective. This type of paint is heavy, expensive, and effective.

Surface Preparation

For the proper selection and use of the various paint types, a proper selection and use of surface preparation must be made.

Solvent cleaning, including steam cleaning, is only a preliminary to other surface preparation methods. Steam cleaning or its equivalent may be necessary to remove accumulated dirt, soil, cinders, and other debris. Other common methods are hand cleaning, power wire brushing and flame cleaning. There are three grades of sand blasting surface preparation — brush-off; commercial; and so-called "cleaning to white metal."

Pickling properly done in the shop gives a surface comparable to blast cleaned steel. A new method of chemical surface preparation using an acid which is subsequently washed off has not yet proven satisfactory for field use in railroad maintenance.

When repainting structures covered with reasonable thicknesses of intact paint, hand cleaning is often sufficient. Until the film thickness or brittleness of the old paint becomes excessive, careful wire brushing is sometimes just as effective as blast cleaning. Where rusting has started, however, wire brushing or blast cleaning must be followed by spot priming with an inhibitive primer.

B&B Mechanization on the PRR

On Wednesday morning, September 21, the last day of the convention, J. W. N. Mays, assistant engineer—structures on the Pennsylvania, presented an illustrated address before the separate session of the B&B Association, entitled "B&B Mechanization on the PRR." Mr. Mays made the following remarks:

One year ago this month C. J. Henry, chief engineer of the Pennsylvania Railroad, gave a detailed speech regarding the mechanization of the Track and Bridge and Building Departments on the Pennsylvania. Today, I will endeavor to bring you up to date, or shall I say give you Part 2, on the mechanization of our Bridge and Building Department. I will show you a film of the Southwestern Region, with headquarters in Indianapolis, Ind., which was used as a guinea pig with the first large equipment secured by the railroad—this film is also used as a training film as each region receives equipment. I will also show slides of various types of work completed and in progress in this region and in other regions mechanized.

Briefly, the Southwestern Region has 1,606 miles of track and 1,064 bridges, buildings and other facilities. The regional forces consist of one supervisor of structures, two bridge inspectors and forty-eight men.

Of our nine regions on the Pennsylvania, we now have five regions fully mechanized and our forces rearranged to operate the equipment efficiently; also, we have four regions partially mechanized and we hope to equip them fully as money is available.

For another example, I would like to give

J. W. N. MAYS
Pennsylvania Railroad

a typical mechanized region with electrified territory located in a heavily populated area. The region is known as the Philadelphia Region and consists of three districts—Atlantic, Harrisburg and Philadelphia. This region has 2,588 miles of track, 2,063 bridges, buildings and other facilities. The B&B forces consist of three supervisors of structures, two assistant supervisors of structures and twenty-six gangs comprised of 180 men. Their equipment consists of:

Two Bantam Cranes of 7½-ton capacity with magnets
Two Hi-Reach mounted on rail-highway carriers
Two Graco Hydra-Spray assemblies
Two True - Gun - All concrete mixing machines
One Strato-Tower, 65-ft, mounted on rail-highway carriers

One Patton grease building and tie coating sprayer
Four sets of Spider staging
Two tool trailers
Five 6-man, self-contained housing trailers
Small tools and safeway scaffold

Operation of the machinery mentioned, except the rail-highway crane, is done by the men in the B&B department. All gangs are made up of composite mechanics.

As of this date, the B&B equipment obtained since 1958 has a value of approximately $900,000 for the nine regions. We are more than happy with the response of the men in the field. It is very gratifying to see them take hold of this machinery, or should I say—take to it like ducks take to water. They have come up with some excellent ideas and have incorporated the machinery to do work that is beyond our expectations. The enthusiasm of our supervision has been excellent and they are happy as they can see something being accomplished—this you will notice in the slides. For the first time in five years, we feel that we are making progress in constructive and preventative maintenance to our bridges, buildings and other facilities.

Our program calls for all regions to be fully mechanized in 1961. We are looking forward to 1961 and the added work that can be accomplished in the B&B department with the additional machinery.

We, of the railroad industry, should pass on all the information that we can to each other pertaining to the use of equipment and the setups that are available on our railroad, or any other railroad that has been mechanized in the B&B departments. We should get together and gather around—and I quote one top official of another railroad who said "We should at once get together and offer all we have to each other to combat the present conditions existing in our economy field."

Gentlemen, do not be misled by what I have said. It sounds like we have had no troubles. Believe me, we have had to work hard to accomplish what we have done. The results of mechanization are due to the management, the supervision, the men themselves, the equipment and, the suppliers who make the equipment. The suppliers have offered us new ideas and have taken our ideas and incorporated them into their machinery. An example of this is the fact that track mechanization came about by railroad men offering suggestions to the suppliers.

The type of equipment that we are using in the B&B department has been used for years. I quote from a gentlemen on our railroad who said "That we are using nothing more than the contractors have used for years but we are adapting the same for railroad use."

One more thing in closing, we must be cautious of purchasing machinery without due thought to adapting machinery to other needs.

Abstracts of Addresses Delivered Before the Joint Sessions

During the opening joint session on Monday, September 19, B. F. Biaggini, vice president of the Southern Pacific, spoke on "The Railroad Supervisor — First Class Citizen." Mr. Biaggini had the following remarks to make:

I am happy to speak to you today as a maintenance of way veteran. My first railroad job was in the maintenance of way department and for more than fifteen years I had almost daily contact with roadmasters, B&B supervisors and their people. So I feel a real sense of homecoming as I have the privilege of meeting with you this morning.

Your work is one of the most important and fundamental in the whole complex business of railroading, and in recent years has been one of the most progressive. The mechanization of roadway maintenance during the past few years has had almost as much impact on the art of railroading as had the change from steam to diesel power.

You who are meeting here have been selected by your various roads because you have the capacity, imagination and ability to press forward with new ideas and the breadth of vision which will further expand the great progress already made in your field.

In his remarks to you last year, President Russell [D. J. Russell, president, SP] laid particular stress on the important part you supervisors can play, *within* our railroad industry, in shaping its future. He pointed particularly to the need for cultivating the broad view of your jobs—seeing them not just as specific tasks, but in relationship to the whole picture of railroad progress and the vital need for eliminating waste and bolstering our financial stability.

The thoughts I want to leave with you

today relate to the same point Mr. Russell made about broadening our horizons, but particularly in relation to our *outside* activities. I want to talk about the importance of broadening out our activities as good citizens and about the tremendous force we can thereby exert for the good of our country.

The degree to which we discharge these citizenship obligations will also have a most important bearing on the future of railroading, and I will say more about that a little later. But mainly I want to stress the substantial influence you can bring to bear in determining whether our whole system of individual freedom and free enterprise is to survive.

I think it is high time that all of us got back to an understanding of the definition of the term "democracy." It means government by *all* the people. It presupposes an awareness of issues and an active expression of individual viewpoints, out of which will evolve local, state and national policies reflecting the greatest good for the greatest number.

Perhaps the outstanding virtue of our system is this process of blending all points of view on all issues. Each of us is free to be a democrat or a republican or have any other political affiliation. We can freely support candidates and measures reflecting our views on farm policies, labor, big or little business, foreign aid and a thousand other domestic and international issues. Our stand, whatever it may be, is generally an expression of our own enlightened self interest, and certainly there is nothing wrong with this.

For us in railroading, it is not enough just to be first class railroaders. We are called on now, more than ever, to be first class citizens as well. The future of our whole way of life demands it of us.

I am going to talk now about how the force we can exert as good citizens relates to our personal interests as railroaders. But first I want to make it clear that this consideration alone cannot be our primary concern. The fact is that our opportunities to help our industry can only grow out of our broad and sincere efforts—the respect and recognition we must first win — as all around good citizens.

At the same time we can be proud of the fact that we *are* railroaders. We can be proud that we are members of an industry that is so important an element in our national strength and progress. And as railroaders we should not hesitate to speak out.

Acting together as good citizens, we railroaders alone can have very substantial political power from the precinct level. And this power can be amplified many times if we but take the trouble to get our story understood by our friends and neighbors.

Interest yourself in the activities of your local republican or democratic club or political association. Participation in such a group will provide you with an opportunity to keep closely in touch with the various candidates and the local and national issues for which they stand. It will also provide you with an opportunity to win support for your viewpoint as a railroader.

Basically important, of course, is that you vote. But beyond this, it is also part of your good citzienship job to see that your friends and your relatives, your fellow workers and your neighbors are encouraged to register and to cast their ballots. Helping to get out the vote is one of the most important contributions we can make to insure that our American system will survive. Let us never forget that right here at our own local precinct level is where every election is either won or lost, even up to the office of President of the United States; and the greater the voter turnout, the greater the chances of electing the man best fitted for the job.

I hope that most of you, as you return to your homes and your jobs, will be thinking a little more seriously about the problems we face as railroaders and as citizens. As you think, surely you'll wonder "What can I as an individual do about it?" To help you remember, let me sum up:

The forces of political apathy and complacency threaten our security.

Our industry is in serious trouble, due largely to over-regulation and its inability to adjust its plant and services to fit the transportation requirements of today and tomorrow.

The individual is the strongest political force in the American democratic system.

Be informed on the issues that affect your industry and you as an individual, and be prepared to work for those issues you believe in and against those to which you are opposed.

Get interested in politics at the precinct level.

Register and vote, and urge all of your friends, relatives and fellow railroaders to do so.

By doing something—the things we have talked about this morning—we can insure that the events which shape the future will be as we want them to be. By doing something we shall surely have earned the title—"first class citizens."

Remarks by G. M. Leilich

Following Mr. Biaggini's address those attending the opening session heard an address delivered by G. M. Leilich, vice president, operations, of the Western Maryland, who spoke on "Safety is No Accident." Here are some of his comments:

Thank you for inviting me here today to discuss with you a topic which is very important and near and dear to my heart. Certainly, I shall not attempt to claim originality for the title of my address, "Safety is No Accident," but I would agree with the philosophy which it expresses. The word "Accident" means something unplanned and unexpected —something that happens entirely by chance. The question of the avoidance of personal injuries and accidents is one which is not done accidentally, if you will pardon the pun, but one which requires a considerable amount of planning and real effort to accomplish. The question of safety involves four areas: namely, at work, at play, at home or traveling to or from any of those areas of endeavor.

Real progress has been made over the years in the area of safety at work, but I regret to state that statistics indicate a much lesser degree of achievement in the other three areas. The statistics for the year 1959 indicated that 32 per cent of the fatal accidents occurred at work, and 68 per cent occurred away from work.

All of this points to a very obvious fact that industry cannot ignore accidents which occur other than at the source of work. The inefficiency, the loss of production and all of the other complications which are created by employe absenteeism, plus the other associated costs which go hand in hand with such lost time, such as the inability of the employe to attain his full productive capacity immediately upon return to work after such a convalescence, plus the insurance costs, all of which are related in the expense of our doing business, emphasize the importance to industry of the field of off-the-job accidents. When the best machine operator you have in your organization is injured while driving home from work, the job efficiency loss is just the same as though he had been injured operating the machine itself. Therefore, my first point in my discussion with you here is that we, in management, must stress and emphasize in every manner within our power the importance of safety everywhere, if I may borrow one of the National Safety Council's current philosophies. This should be done through the media of movies, slides, publicity, posters, any way that we can drum the idea into the heads of our employes that they must not close their mental doors on safety when they leave the property.

Now dealing with the topic, "Safety is No Accident," in another vein, the question naturally arises: What do we do about all of this? Well, you who are members of community organizations, either local or national in nature, such as I, are doing what we can in this respect from a public education and information viewpoint, as well as trying to make our concern felt where it can do the most good—in some of our legislatures. This is all in the interest of promoting public safety. You here are more directly concerned with what you can do in your own specific area of responsibility—that of safety at work. In my opinion, safety is just as important a part of the obligation and duty of a supervisor as is whatever the production responsibility of his department may be. One cannot exist without the other. A supervisor who looks only at the number of track feet raised per man hour or per dollar and ignores his accident statistics, is not a competent supervisor. Since America professes to be a Christian nation, it is difficult to reconcile the reluctance and lack of interest on the part of the average supervisor in trying to do something constructive and sincere about being his brother's keeper, if you will, or promoting the welfare of his own employes.

An exhaustive study of the Western Maryland's own accident statistics for the past 26 years has revealed that accidents are predictable, with awesome accuracy. Our records show that August is the month in which the greatest number of accidents occur each year. It is the month in which 11 of the 52 fatal accidents that have been recorded on our system in the past 26 years have occurred, and the majority of those fatalities have resulted from daytime accidents. We know that all accidents on each of our railroads are traceable to either mechanical or personal faults. We know, therefore, that every accident is avoidable—or could be, if those faults were corrected before they precipitated accidents.

If every accident fundamentally is traceable to unsafe conditions—such as faulty equipment, tools, machines or other conditions at the scene of the accident—or unsafe people, why have we been unable to eliminate accidents on our railroads? Could it be that we have given our attention too exclusively to correcting unsafe conditions, without corresponding emphasis on correcting unsafe workers?

Installing a safeguard on a machine does

not make it safe if the guard is shoved aside when the machine is in operation. Providing a guardrail along a steep staircase does not protect the workman who scoffs at using the rail. Safety lectures and instructions provide no insurance against accidents for the man whose thoughts were somewhere else when he nodded indication of having understood words of caution.

In other words, have we dealt realistically enough—perhaps persistently enough—with the human causative factor in railroad accidents? Every piece of machinery and equipment, every tool and every working area, in the modern railroad plant has undergone close scrutiny in the past quarter-century. Each has been revised, revamped or remodeled so that safety has become a functional component of its design . . . so that it "cannot" be an accident factor. Yet each must be utilized, operated or at least maintained by railroad personnel, and each continues to play a role in accidents.

One of the tragic patterns that have emerged from our railroad's hindsight look at accident statistics is that in the '50's the same injuries were sustained by the same number of workers in the same departments as had been in the '30's. Despite a safety-engineered environment, the same old injuries are attributed to the same old causes—and none of them ever admissive of personal responsibility.

As inconclusive as it is at present, our retrospective study of accident records seems to indicate that the great majority of personal injuries—including fatal ones—on our railroad are traceable to unsafe workers. In nearly every case, the accident victim or a co-worker has acted in an unsafe manner, either because he was ignorant of the safe way or chose to ignore it, because of hurry or thoughtlessness.

Remarks by H. C. Murphy

The first speaker at the second joint session, held on Tuesday morning, September 20, was H. C. Murphy, president of the Chicago, Burlington & Quincy. The subject of Mr. Murphy's address was "Our Stake in the Future of the Railroads." He had the following comments to make:

Those of us who pursue our respective careers in railroading have a very real stake in its future, as should millions of other Americans—whether they realize it or not. Operating efficiency, and the extent to which our industry is permitted to function in a truly competitive fashion, has a definite bearing upon the health and vigor of our national economy. More importantly, the preservation of a rugged rail transport system is vital to the safety of the nation.

At present we are engaged in a fiercely competitive struggle—one beset with unfair and unnecessary restrictive handicaps. To the best of my recollection, we have never before been confronted with competition of such magnitude, nor so sorely harassed in our efforts to meet it.

To an alarming extent, the most dangerous competitors of the railroads — and for that matter all modes of common carrier service— are the virtually unregulated contract and private carriers, some of which hold themselves out to serve and do serve the public, yet are substantially free of the limitations imposed by law upon the true common carriers, chief of which are the railroads. In the field of passenger transport, the private automobile is by far the major operator. So long as its operations remain truly private, public transport has no just complaint. But the impact of unregulated competition upon the genuine common carrier—notable the railroads—is most unfair and most severe in the field of truck and barge transportation. That is what I propose to discuss with you briefly today.

Since World War II, private intercity truck carriage had increased about five times, from 30 to 143 billion ton-miles annually. During the same period, "regulated for hire" common carriage increased better than three times, from 25 to 84 billion ton-miles annually. During the same period the river and canal barges increased from 29 to 113 billion ton-miles annually—or nearly four times greater.

Less than 10 per cent of the barges operating on the inland waterways are regulated. Not more than 30 per cent of the trucks operating on our highways are regulated. The rest are privately owned and privately operated. And one wonders why the government in dispensing such huge sums of the taxpayers' money wouldn't look beyond the question of comparative economics of barge operation versus rail operation and see just who gets the benefit of these lower ton-mile costs afforded the barge lines.

In contrast railroads are subject to complete and rigid regulation, placing them at a pronounced competitive disadvantage for important traffic. Clearly what is needed—and soon—is a drastic revision of regulations so that rules applying to one type of public carrier apply to all public carriers. Not only does elementary fairness demand this, but in the long run the public is sure to suffer from

a policy which stifles free enterprise on the part of essential public transport.

Why railroads should not be able to compete for transportation of exempt freight at a rate which would yield a fair return over and above actual costs is beyond comprehension.

Since you are accustomed to taking the initiative when faced with problems, I know you are probably asking: "Well, what can I do about it?" In my opinion, the answer is simply this. Seek out every possible opportunity to do your job ever more efficiently and effectively than before.

Fortunately, the railroad industry has many capable people on its team. Your job of building and maintaining the track, bridges and roadway structure is a very important one. How well the industry meets the competitive pressures and discrimination presently facing it will depend in large measure on how well all of us do our job. Every dollar saved on railroad operations enhances our ability to improve both property and service. Upon you particularly, falls the responsibility of using the funds available to build necessary and the maximum ruggedness and strength possible into the railroad structure.

And it is important that you keep management informed of new tools and procedures that will enable you to do an ever better job. It is also your responsibility to get the maximum use from these tools. Some of the newer equipment, as you are aware, can be used on a double shift, thus affording greater utilization and efficiency, and assuring a higher per cent return on the investment. But what must be a great satisfaction to you is that the provident use of manpower, improved materiel, tools and equipment enables you to do more of the things you want to do to improve the property under your charge.

Management looks to you for help in planning ahead. Because of your comprehensive knowledge of the property, you are particularly well qualified to look into the future and program what should be done to strengthen and improve it. There may be times when, because of reduced revenue, management will be unable to carry out all you recommend, but you may be sure your recommendations will not be forgotten. In a word, yours is the all-important trust of safely maintaining the property with the funds allotted to you. In good times adjust your programs to build up the extra strength so as to be prepared for a "rainy day" when revenue falls off and you are compelled to lower your sights. Then you will be able to do so because of your provident use of what you had in the good years.

You and I—and every member of the railroad team—assume the added responsibility to inform himself about what needs be done to restore our railroads to the growth position to which they are entitled. We must acquaint others of the need for a modern set of transportation laws. Eventually, and soon, let us hope our lawmakers will become aware of the fact that Americans really do want a square deal for railroads, as I believe the majority of them do. Once our lawmakers are convinced of this they will act. Only then will our industry resume its former role as the pace setter for a growing America.

Remarks by J. Handley Wright

Following Mr. Murphy's address members of the Bridge and Building and Roadmasters' Associations heard an address by J. Handley Wright, vice president of the Public Relations Department, Association of American Railroads. Mr. Wright spoke on "Public Relations—Responsibility and Opportunity." He had the following remarks to make:

After accepting your invitation to meet with you this morning, I happened to mention the fact in conversation with a president of a large and important road. Some days later, I received a letter from him commenting on this meeting and I would like to read you a paragraph from that letter. It might well serve as a text for the few remarks which I have to make.

"The basis of good public relations," this railroad president wrote me, "is how those who are not connected with the business react in their contacts with other members of the public. Therefore, it is important that whatever services be operated by the railroads, be topnotch in every respect. This applies to train handling, the serving of meals, the actions of the train crews, the actions of the Pullman crews, the riding of the equipment, and perhaps, even more important, good mechanical maintenence of the equipment." He might have added with equal aptness a few other basic facts such as morale of employees, how they speak of the industry to their neighbors across the back fence, how shippers are treated, and the general image of the industry before the public and the legislators.

Whether this railroad president knew it or not, he was expressing the oldest rule of public relations, namely, that actions speak louder than words and that performance counts for more than promise.

By and large, we in the railroad industry

are going to enjoy or suffer from the public opinion we deserve. If we consciously strive to deserve the public's good will, we will eventually achieve it. If we make few or no conscious efforts along this line, we will deserve and receive a good deal less enthusiastic support from the public.

J. Carlisle MacDonald, until recently assistant to the chairman of U. S. Steel Corporation, in charge of public relations, once put it this way in a thoughtful paper published in the Journal of the Public Relations Society of America: "It must be assumed that every employee is in fact a public-relations representative of the company. No other premise is tenable. Every employee is going to pass on to others his own impressions of his employers."

If you follow my thesis that we all have an opportunity and a responsibility to talk up our good points, to project a picture of our industry as a live and vigorous economic force in our national life, then take a look with me at some of the things we've got to be proud of and to brag about.

First, there are the exciting new applications of modern technology which our industry is making. To mention only a few, micro-wave transmission, employed by the Santa Fe, the Southern, Southern Pacific, Rock Island and several other roads; Centralized Traffic Control, already in effect on more than 30,000 miles of American line; atomic powered signal lights; electronic detection of hot boxes; use of high speed computers and electronic brains in railroad statistical work and the exciting growth of piggyback. While still representing only 1.3 per cent of all railroad traffic, the growth rate of piggyback is truly astonishing. Last year the business doubled over 1958. In the first 8 months of 1960, piggyback was up another 35 per cent or 95,898 cars over the same period of 1959. Then there is the growing number of automatic classification yards, each a highly integrated complex of commuications, push-button switching, radar speed measuring, electronic speed control, automatic retardation and automatic switching.

Another impressive reason for optimism springs from passage of the Transportation Act of 1958. Granted, the act was only a start in the right direction, it at least marked the end of 18 years of public apathy toward railroad problems and provides a solid foundation upon which Congress can continue the job.

Growing out of the passage of this act is another truly significant reason for optimism, namely an aroused, interested and sympathetic public opinion with respect to the railroads. Passage of this act in the summer of 1958 was followed by a public-opinion survey conducted at our request by the Opinion Research Corporation. This survey disclosed, among many other significant facts, that 33 per cent of the public actively wanted Congress to do more to help the railroads and that 44 per cent had no particular opinion on the point, making a total of 77 per cent who at least had no objection to further congressional action in behalf of the railroads.

From these statistics it is fair to assume that the public is interested, sympathetic and willing to be helpful to the railroads. As a member of this great industry, do you not consider that you have an opportunity as well as a responsibility to cater to this public interest?

In closing, I can offer no better thought than that expressed by a railroad president in a recent talk to members of our industry. "Remember," he said, "how prosperous a future the industry as a whole can look forward to depends very much, I think, on how soon and how effectively everybody concerned begins to think in terms of the present and future instead of the past. We are a business, not a monument."

Let us remember that the hardest thing to change is attitude—our own as well as others. I have shown you that your own attitude toward our industry has a tremendous effect on the public's attitude. I have shown you the public is receptive toward our industry. It is your responsibility as well as your opportunity to give the public the right attitude. I am sure you will not fail.

Remarks by F. R. Woolford

The last speaker of the joint session on Tuesday morning was Frank R. Woolford, chief engineer of the Western Pacific. Mr. Woolford related some of the things he saw during his recent trip over the railroads of European Russia in company with representatives from the AAR and other American railroad officers. He made the following comments:

On Sunday afternoon, June 5, our party moved into their assigned special sleeping car with attached dining car which had been arranged for our use during the three week's tour of some 6,000 miles of the Soviet railway in Europe. While in Moscow, we met all the department heads of the railway system. We were briefed by these individuals as to the departmental operations and received

answers to the many questions we asked.

We were told:

1. There are 35 railways in the Soviet system, each in the charge of a president or director.

2. The Soviet railway system totals some 120,000 road kilometers (74,400 miles).

3. The system now has 12,000 kilometers (7,440 miles) of electrified operation of a plan for a total of 30,000 kilometers (18,600 miles) of electrified operation by 1965.

4. They plan for 70,000 road kilometers to be dieselized by 1965. Actually, their overall plans are to have 35 or 40 per cent of the entire system electrified, some 65 per cent of the system dieselized, and they hope to retain 5 per cent of steam operation. They actually have diesel locomotives now that have proven out and in actual production of 3,000 h.p. They have one ready to go on test in the field of 4,000 h.p. They are making gas turbines. They have one gas-turbine right now ready to go in the field tests that has 6,000 h.p. and they hope to go to 8,000 h.p.

5. That the Soviet railway has operated and can operate 100 to 125 train schedules in each direction on single-track railroad in a 24-hour period.

6. That the railways in the United States are approximately three times the length of the Soviet system, but the Soviet handles half again as much more freight tons per mile of traffic than the United States railroads.

7. That freight-train speeds are set at a maximum of 80 and 100 kilometers per hour (although our observations of the operating train speeds would place same at an average of 35, not to exceed, 40 m.p.h.).

8. That passenger trains operate at speeds of 100 to 150 kilometers per hour (however, our observations indicated such speed to not exceed 55 m.p.h., normally an average of 45 m.p.h. There was one exception—the Red Arrow—which we rode between Moscow and Leningrad. The claimed speed for it is 94 m.p.h. but at no time during our ride did we check the train faster than 88 m.p.h. It normally operated between 60 and 70 m.p.h.)

9. The Soviet system has 12 institutes or railway universities in different cities on the system which are called institutes of railway engineering. In 1917, only two such universities existed in Russia—one at Moscow and the other at Leningrad. Some 9,000 students are graduated annually from these and other railroad institutes. (Kharkov, a school where we spent considerable time, will graduate 800 in 1960.) Sixty per cent stay with the railroads and 40 per cent go to other industries usually related to the railroads. The Russian Institute, as an example of student attendance, has 60 per cent men and 40 per cent women.

In Russia, there is no recognized difference between the sexes. Men and women do the same work. They use the same places. You will find more women out on a line of road doing hard track work than you will find men. Usually the men are the supervisors and the women do the work. They are in the car shops, locomotive shops and in every conceivable type of business you find in Russia. And, most of them are proud of it.

10. Adequate funds are provided annually for research facilities. As an example, the Kharkov Institute was given five million rubles to spend for laboratory needs in 1960, and the Moscow Institute was given seven million rubles.

Thence, we went to Tula, where we witnessed a panel-track and ballast-replacement capital-budget operation on a line of road being progressed through the use of what mechanical equipment was available.

The general condition of track could be classified as a stout track construction with good treated-wood and a few newly developed prestressed-concrete ties; good rail but of a light section, mostly R-43 (similar in weight to U.S. 87-lb.) and R-50 (U.S. 101-lb.) varieties with a limited amount of R-65 (U.S. 131-lb.) and a very small amount of R-75 (U.S. 151-lb.) rail sections; very poor ballast and an associated irregular line and surface of the main track. Curves are poorly alined, irregular and usually improper superelevations, with little or no transition run-off at the ends of the curves. For the slow operating speeds the Soviets use, their train track condition is undoubtedly suitable for their needs but not for American operations.

Safety of employees or the public along line of road is of little concern at this time as reconstruction is the major objective. Anything else is secondary to a quantity operation.

Mechanization of roadway construction and maintenance activities are at a very low ebb. The available machines are of enormous size. Few, if any, of the roadway endeavors are completely mechanized. Hand labor is a major item in all roadway operations for which an over-abundance of both men and women are used.

On an overall and general comparison basis, in my opinion the Soviet transportation arm is in no way equal to our American rail-transportation system. Actually, I would

say they are at least some 20 or more years behind our progress. True, the Soviets have: A strong basic track structure, but it is poorly maintained; a well-planned educational and research organization, but lacking that needed practical application; and a well-planned car and locomotive objective, although proceeding most slowly to accomplishment. Possibly, the foremost point in their forward strides is that certain desire, on the part of all employees of the system, to become the best rail transportation system in the world. They consider only the United States' rail system as being superior and further advanced than their own, although they are taking every step possible to equal or excell our status.

Bridge Inspection Procedures by B&B Forces

Report of Committee

COMMITTEE—J. S. ELLIS, *Chairman,* supvr. b. & b., C&O, Grand Rapids, Mich.; R. D. BISBEE, *Vice-Chairman,* div. engr., P&SF, Slaton, Tex.; H. M. HARLOW, *Vice-Chairman,* asst. gen. supvr. b. & b., C&O, Richmond, Va.; H. F. BIRD, dist. engr. struct., NYC, Syracuse, N. Y.; W. S. BROWN, engr. b. & b. maint., B&O, Baltimore, Md.; P. C. CHAMBERLAIN, asst. to engr. struct., ERIE, Cleveland, Ohio; D. H. FISHER, supvr. br. maint., CMStP&P, Chicago, Ill.; E. T. FRANZEN, engr. of br., CRI&P, Chicago, Ill.; R. R. GUNDERSON, engr. m. of w., WM, Baltimore, Md.; J. A. JORLETT, area engr. struct., PRR, Philadelphia, Pa.; H. H. KRUSE, ch. carp., CMStP&P, Minneapolis, Minn.; E. T. LEA, ch. engr. m. of w. & s., C&G, Columbus, Miss.; A. A. MCDERMOTT, b. & b. supvr., SP, Dunsmuir, Calif.; R. F. MOLINE, br. engr., DT&I, Dearborn, Mich.; R. PATTERSON, const. consult., Chicago, Ill.; M. L. REYNOLDS, sr. asst., b. & b. supvr., SP, Bakersfield, Calif.; E. F. SIMONSON, b. & b. supvr., SPOKANE INT., Sand Point, Idaho; G. SWITZER, gen. supvr. struct. and wk. equip., WP, Oakland, Calif.; T. M. VON SPRECKEN, asst. to ch. engr., SOU., Washington, D. C.; C. E. WACHTER, b. & b. mast., CNR, Port Arthur, Ont., Can.; P. M. WALKER, asst. b. & b. supvr., MP, Little Rock, Ark.; R. C. WELLER, div. engr., CNR, London, Ont., Can.

J. S. ELLIS
Chairman

It is generally concluded that timber trestles be inspected three times a year, spring, summer, and fall; and concrete and steel bridges twice annually, spring and fall. More inspections should be made depending upon the character of the work to be done, and whether or not the bridge contains treated or untreated material. Bridge inspection should not be limited to the time of year set aside for that purpose, but the supervisor or assistant should inspect any bridge whenever in the vicinity of the structure. The routine inspections should be made by the assistant supervisor B&B, or another competent person assigned to these duties.

Regardless of their size or location, bridges should be inspected at least once every year. This inspection should be thorough and systematic; and the inspection party should include the general supervisor B&B, division engineer, supervisor of B&B and the roadmaster of the territory being inspected. It would be desirable at this annual inspection to have a representative of the bridge department present, so that work can be programmed in the order of importance, and labor and material expenditures discussed.

The bridge foreman when making repairs should make it a point to inspect every part of the bridge, thereby becoming familiar with the bridge and aware of any condition that might exist that would require future repairs. He should observe how the structure reacts under live load, noting excessive vibration, deflection and side sway. He should report to his supervisor on the general condition of the bridge, and on particular points to be considered.

A complete running record should be kept of the inspection of every bridge: A single sheet for each structure, containing information pertaining to every member of the

bridge, number and location, type of construction, length, number of spans, whether single, double, or multiple track, height above water; and if highway bridge, number and/or name of highway. The inspector should note carefully each time he checks each structure, the date, any defects found, whether or not previously noted minor defects have been corrected or have deteriorated further, any needed work, and how urgent the work seems to be. Copy of this record is to be sent on the day made to the supervisor B&B, who will examine it closely and make the necessary arrangements to correct any defects noted that require immediate attention, bringing such matters to the attention of the division engineer. Matters of major consequence will be investigated further by the supervisor and division engineer, and estimate of labor and material furnished the bridge engineer so that plans can be prepared, and the work begun.

Time

The time spent inspecting each bridge should be such as to permit a complete and thorough inspection. As much time should be spent at each location as will insure that every possible angle of the inspection be covered. After all, the purpose of the inspection is to determine the extent of maintenance to be performed, the safety of the structure, and the repair program to be formulated.

The routine inspection may be shortened to include a brief survey of the integral components, and a closer inspection of known defects to determine whether or not they had become worse since the previous inspection, or whether new defects have become visible.

Transportation

The rail motor car is the most direct means of travel, but the inspector at times is handicapped because of location of set-offs, and time allowed between trains to make the inspection. It is generally concluded that an auto or pickup truck equipped with a flanged wheel attachment for travel on highway or rail is most desirable in making the inspection. A great deal of time is saved, and much of the back-tracking normally encountered by use of an individual vehicle is eliminated.

Where a highway parallels the track, it is a simple matter to travel between structures, and as much time as need be can be spent at a location. When necessary to travel by rail to inaccessible bridges, no more inconvenience is encountered with the use of a combination vehicle than is normally realized with a rail motor car.

Bridge Inspection in General

The inspector shall proceed as follows: Examine track line and surface. Bad approach conditions will result in surface-bent rail and excessive plate cutting on end ties; and such condition, if permitted to continue, could be cause for a derailment. Examine the condition of the rails. See that all joints are securely bolted, there is full bearing on all ties, and that the rail is properly spiked. Examine all ties and timber guard rails for soundness. Inspect the ends of ties and around the plates for decay, and see that the ties hold the spikes firmly, that all bolts are tight, and that nothing projects above the top of the running rail. Examine foot walks and hand rails. Check the alinement of the track to see that it corresponds with the alinement of the bridge.

On ballast decks, note if ballast section is full and if there is any indication that stringers have separated and deck boards have become rotten or broken, which would allow ballast to become low. On open decks, stringers should be examined for sloping grain, horizontal or vertical cracks, or end crushing.

Examine and report the condition of all fire protection equipment. See that all vegetation under the bridge has been removed.

Inspection Procedure for Steel Bridges

The inspector shall proceed as follows: Inspect all iron and steel work in metal structures and see that the steel is clean, free from rust, and that no water pockets are formed at the panel points. Examine every part to see that it is in true line, uninjured and in proper adjustment. Examine the line of girders to see that it is correct, and that the girders are setting plumb on the pedestals. Examine the bed plates, rollers and their frames, to see that they are true and level and in proper working order. See that all trusses and girders have a uniform bearing on the rollers, bed plates or pedestals.

Examine all rivets to see that none is loose, reporting all loose rivets and giving their location by bridge member and the number of loose rivets in each. It shall not be required that all rivets be tested more than twice each year, except in certain members where the rivets are especially liable to become loose. Examination of such members should be made at least twice annually. Give particular attention to any member which shows evidence of wear by becoming loose, rattling or rusting. Give particular attention to all web members of trusses, lateral bracing, floorbeams and stringer connections, yokes or hangers, and connections at pins. Observe the action of the structure under trains operated at scheduled speeds. Note if any tension member becomes slack, or if any buckling occurs in compression members. Note any perceptible yielding of the floorbeams or stringers, or any perceptible side motion of the structure, or excessive deflection under traffic.

Pay particular attention to the details of metal structures as outlined above when the bridge is on a curve. Look for loose rivets in all angles, especially in floorbeams and

stringer connections. Examine the steel for cracks at the root of all angles and web plates of girders, floorbeams and stringers. Examine top and bottom cover plates and angles, flange angles of deck girders, and floor system of through girders and trusses for deterioration from rust and other causes. Carefully examine all bearings where girders rest on pile or frame bents, posts or towers, and see that the girders have a full and true bearing and are firmly anchored. Note condition of paint and when last painted.

Pay particular attention to alignment on through structures. Note if track is centrally located. A track eccentricity of only three inches on a through structure reduces the allowable width of shipments six inches, and may very easily be cause for loss of revenue from long-haul movement. In addition, track eccentricity throws stresses on one side of the structure, a condition that must be avoided.

Inspection Procedure for Masonry, Concrete and Composite Structures

The inspector shall proceed as follows: Examine each structure for any evidence such as inequality in line or surface of track, or improper spacing between back walls and end of support of structure, indicative of settlement or other movement. Observe action of structure under traffic at normal speed, and note any movement in joints or courses of masonry, or any rocking of the structure as a whole. See that movement in expansion joints is unobstructed; and that all bridge seats and cap stones of pedestals are properly set, and report any movement or cracking of same. Note any evidence of undue weathering, disintegration, cracks, crushing, leakage, bulging, or need of pointing.

Examine foundations for any indication of scouring or undermining, taking soundings where necessary. Report any change of channel or deepening of the stream bed. Observe any indication of incipient failure of arch rings, indicated by flattening or cracking. Report any indication of leakage or softening of the concrete in concrete metal structures, or exposure of reinforcement. See that drain ducts are functioning properly. Give special attention to new defects and to the cause thereof.

Inspection Procedure for Timber Bridges

The inspector shall proceed as follows: Examine all timber, boring when necessary with a ¼-inch increment bore to discover interior decay, plugging hole with treated plug made for that purpose. A pointed inspection bar should not be used to check soundness of stringers, caps, pilings, posts or sills above the ground line, as this probing subjects the timber to unnecessary damage. It is permissible to examine all piling or posts below the ground line with a pointed bar. Examine chords closely at splices, and all stringers at bearing points. Examine diagonal and vertical braces and laterals to see that they are in place, sttaight and sound, and not crushing at ends. Examine all blocks and report those broken or cracked.

Examine every part of the structure in detail and note condition. Report any scouring or accumulation of drift around support bents. Report any deviation in the construction of a structure from standard plans. When additional stringers are placed for purpose of strengthening for heavier loading, see that they are receiving a proper proportion of the load. See that all timber bents stand plumb and have the proper transverse bracing. See that high trestles are braced longitudinally in accordance with standard plans.

Stringers should be drilled near the bents, from the underside if possible, and the chips examined for decay. Examine caps and sills for bulging sides, presence of green algae or growth indicating trapped moisture, and incipient dry rot, poorly framed posts or piles which do not fully contact the cap, horizontal splitting and checking, crushing of the cap fibers immediately above the piles, and hollow ends. Sound all timber by striking with a hammer. This may reveal presence of decay or hollow spaces within. Check all line spikes, spacer bolts, drift pins, anchor bolts, etc.

Inspection Procedure for Masonry Structures

The inspector shall examine as follows: Note condition of structure, including whether there are cracks or signs of settlement, and whether or not masonry needs pointing; also, if any cracks have opened since last inspection. The inspector shall examine for the following: Overloading of foundations, indicated by vertical settlement or pumping at the ground line. Local overloading of foundation, indicated by sagging of the horizontal joints, open vertical cracks and crowding of back walls toward the span. Weakening of the foundation, caused by scouring or undermining. Failure of bond between stones, indicated by looseness or absence of mortar at joints. Vertical cracks, caused by uneven bearing. Bulging of parts of surface, indicating internal failure. Disintegration at water line or ground line, caused by frost or other causes. Surface disintegration of stones, indicated by weathering, spalling, laminating or slicing and breaking out of small parts.

Inspection Procedure for Concrete Structures

Examine bridge seats and piers. See that anchor bolts are in place, that there is no evidence of unusual movement, that rollers are not locked to prevent expansion, that masonry plates are not embedded in the concrete to form water pockets. On concrete decks, particular attention should be given to

approaches, and condition of ballast; also, examine to see that drainage has been provided and is functioning properly. Wing walls should be given close attention. Their stability is necessary to insure integrity of the approach embankment. All concrete should be examined, old cracks should be measured and noted, and compared with previous observation. Any new cracks should be measured and a record made thereof. There are no new devices on the market that will supplant a good inspection as outlined above.

Conclusion

The results to be gained from proper inspections are many and varied. They include reduction in operating hazards, fewer emergencies from failures of material which should have been remover earlier, reduction of maintenance expense, and a better planned maintenance program, as well as the confident feeling that comes from a job well done.

Outfit Cars Versus Highway Trailers for B&B Gangs

Report of Committee

COMMITTEE—H. M. WILSON, *Chairman,* supvr. struct., PRR, Chicago, Ill.; F. W. HUTCHESON, *Vice-Chairman,* supvr. b. & b., C&O, Newport News, Va.; C. E. NEAL, *Vice-Chairman,* div. engr., NWP, San Rafael, Calif.; E. H. BARNHART, div. engr. (ret.), B&O, Shepherdstown, W. Va.; W. E. BUGBEE, proprietor, CANAMEX COMPANY, San Antonio, Tex.; W. W. CAINES, supvr. b. & b., C&O, Huntington, W. Va.; M. D. CAROTHERS, asst. ch. engr. (ret.), GM&O, Bloomington, Ill.; S. A. COOPER, ch. engr., GM&O, Mobile, Ala.; R. K. CORBETT, gen. fore. b. & b., AT&SF, San Bernardino, Calif.; E. M. CUMMINGS, div. engr., B&O, Connellsville, Pa.; H. D. CURIE, mast. carp., B&O, Garrett, Ind.; J. T. HINER, ch. engr., m. of w. & s., SOU., Cincinnati, Ohio; J. D. MOORE, supvr. struct., PRR, Harrington, Del.; L. R. MORGAN, asst. res. engr. struct., AAR, Chicago, Ill.; C. F. PARVIN, engr. m. of w. & s., PRR, Philadelphia, Pa.; J. R. PEARCE, supvr. b. & b., L&N, Latonia, Ky.; E. R. SHULTZ, engr., m. of w. & s., PRR, Philadelphia, Pa.

Reports from committee members on our subject "Outfit cars versus highway trailers for B&B living quarters" indicate that there is strong support for both sides of this issue. This report will try and point out both the advantages and disadvantages of outfit cars and trailers and it will be up to you, the members of our association, to decide which is most advantageous for your particular location and force.

Camp Cars

We shall start with camp car outfits. Camp cars have long been the living quarters for B&B forces and in the last few years we have seen converted steel cars with gas or oil for heating, cooking and water heating; cars that are well insulated and have modern showers and washing facilities, electric ice boxes, good beds and other modern conveniences. However, due to low appropriations on most roads, a large proportion of the outfit cars still in service are the old wood variety with which you are too well acquainted. The major advantages of camp cars are as follows:

(1) There is an abundance of room per individual man for cooking, sleeping, washing and recreation and the men do not feel cooped up.

(2) Toilet facilities are good and with very little odor.

(3) They are always on railroad property and less subject to local health laws and regulations.

(4) Plenty of space for tools and materials, simply by adding additional cars.

(5) Handled by our forces without huge public liability which trailers demand.

(6) No outlay for insurance, license fees, trailer camps, etc.

(7) Sleeping, kitchen, recreation, tool and material cars are generally moved over a week-end when the men are home and does not disrupt the force or take men off of regular work to move them.

(8) All the cars attached to the B&B gang are together at one location with all necessary tools and materials.

The major disadvantages of camp cars are as follows:

(1) Spurs on side tracks must be close to job sites or too many man-hours are lost getting to and from the job.

(2) Schedule of trains does not always provide for moving when desired.

(3) Abundance of space tends to invite accumulation of trash and junk.

(4) Shopping of cars for repairs can be a serious problem and one over which the B&B departments have no control.

(5) The old wooden cars require heavy maintenance repairs after almost every move.

(6) The old cars are cold and drafty in winter.

Highway Trailers

Some railroads have made heavy investments in highway trailers for housing B&B men. The one big factor in their use is they are new and modern and with small gangs, can be moved quickly from job to job.

The major advantages of highway trailers are as follows:

(1) In most cases, new and tight.
(2) Mobile—Do not need to depend on local freight service and can be moved when desired.
(3) Can be located right on job site.
(4) Very little preparation for moving.
(5) Compact, but enough space to be comfortable, resulting in better housekeeping.
(6) All modern conveniences.
(7) Most men take pride in living in new sleek trailers.
(8) Repairs can be made quickly at minimum down time.
(9) Warm and well insulated.
(10) Small gangs are more easily housed.
(11) Little or no damage when moved.
(12) Can be located close to water and electricity.
(13) Can be ready to move in an hour or so, in case of emergency.
(14) More healthful to live in than old wooden camp cars because they can be kept cleaner with a minimum of effort, and a more even temperature can be maintained.

The major disadvantages of highway trailers are as follows:

(1) Operation and use complicated in some states due to regulations, such as parking in licensed trailer camps, hooking up to sewers, etc.
(2) Confined feeling for men moving into trailers after having been in outfit cars.
(3) When more than one trailer, must provide extra truck or trucks to move.
(4) Most trailers have chemical toilets with objectionable odors although some of the new ones have electric incinerators.
(5) No place for recreation except kitchen area.
(6) Takes close planning to move trailers without disturbing the gang during working hours.
(7) Must have individual water or electrical units if parked in country near job site.
(8) License fees, public liability insurance necessary.
(9) Moving in ice and snow sometimes a problem.
(10) In some localities, because of the terrain and lack of good roads close to the railroad, trailers do not lend themselves to economical operation.
(11) Must have man from gang move during working hours in most cases.
(12) Trucks must be equipped with trailer hitches and separate brake controls for trailers.
(13) In some cases where camp cars are used for tool and material storage, the trailers and cars are some distance apart, resulting in lost time going between them.

Conclusion

You have heard the advantages and disadvantages of both outfit cars and trailers. It is apparent that neither of these means of housing B&B forces will suit all the requirements in all cases. We, the committee, feel that, in trying to sum up all the facts we have gathered, highway trailers in most cases, have a definite advantage for small gangs consisting of four to six men and requiring few large tools and heavy materials. This would apply to small gangs working on roadway buildings, interlocking towers, small bridge jobs, etc.

For the larger gangs of ten to fifteen men, a camp car outfit would probably be best. These are generally the larger gangs doing major bridge and building jobs and needing storage for larger tools, bridge timbers and other material.

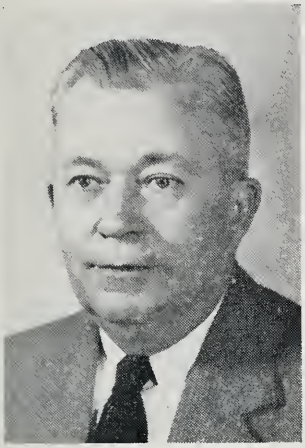
We have tried to assemble cost data on both camp cars and highway trailers, but do not have enough information to draw any definite conclusions. We have had estimates of anywhere from $2,500 to $10,000 to convert steel cars for housing B&B forces and from $200 per year to $2,000 per year for maintaining camp cars. The cost of new four to six men trailers runs on an average from $2,200 to $4,800 each. Most of these trailers, being only a few years old, have had little or no maintenance done on them; therefore, it is difficult to come up with figures giving a definite maintenance cost.

There are more conclusions that can be reached, but in the end, the individual supervisor must weigh the advantages and disadvantages of either type of living quarters and pick that which is best suited for his operation.

Automatic Heating Plants

Report of Committee

COMMITTEE—W. J. MALONE, *Chairman,* off. engr., GTW, Detroit, Mich.; C. C. GREEN, *Vice-Chairman,* mast. carp., B&O, Wheeling, W. Va.; M. JARRATT, *Vice-Chairman,* water and fuel supvr., SP, Tucson, Ariz.; W. H. BUNGE, asst. engr. (ret.), MP, St. Louis, Mo.; A. W. CHARVAT, engr. arch., CRI&P, Chicago, Ill.; P. E. DUFFY, supvr. b. & b., GN, Minneapolis, Minn.; G. F. FRITZINGER, asst. engr., WABASH, St. Louis, Mo.; W. G. HARDING, arch., WABASH, St. Louis, Mo.; R. J. MCDIARMID, supvr. b. & b., EJ&E, Joliet, Ill.; W. F. PETTEYS, engr. m. of w., ERIE, Jersey City, N. J.; J. H. STINEBAUGH, supvr. water serv. and rdy. mach., IC, Carbondale, Ill.; J. F. WARRENFELS, ch. engr., JACKSONVILLE TERM., Jacksonville, Fla.; J. K. WEIKEL, asst. div. engr., ERIE, Hornell, N. Y.



W. J. MALONE
Chairman

This report will be a brief outline of a number of the modern methods of automatically heating various types of buildings, offices, shops, and other structures that are commonly used in the normal operation of our railroads. It will cover initial cost, operation cost and service life of the more popular types of heating systems now in use throughout the country.

The main problems involved in heating a particular structure are:

(1) Determination of the load requirement.
(2) Procurement of heat from some source.
(3) Selection of a medium to act as a carrier of heat.
(4) Conveyance of the heat produced to the proper location by means of an acceptable system.
(5) Satisfactory and successful distribution of the heat within the space to be heated.
(6) Regulation of the heat supply and air temperature by various means.
(7) Maintenance of the cycle of operation on the different phases of the system chosen.
(8) Reduction of heat losses.

In order to produce and maintain healthful, comfortable, and desirable air conditions within a building, it is usually necessary to introduce and remove from the building a definite amount of air per unit of time. This change of air, which can be accomplished by either natural or mechanical means, is referred to as ventilation.

The term automatic heating plant is known as any system which is controlled by automatic control devices, used in heating or air-conditioning a building to provide the desired conditions along with maximum economy of operation. Devices used for the purpose mentioned include thermostats of various types and actions, liquid level controls, humidistats, dampers, valve motors, fuel pumps and conveyors, pressure regulators and a wide variety of safety controls to protect personnel, property and equipment.

Listed below are the types of automatically controlled heating systems which your committee has found to be widely used:

Source of heat	Method of Distribution
(1) Coal	(a) Steam—pipes—4 types
	(b) Hot water—pipes—3 types
	(c) Warm air—metal ducts
	(d) Unit heaters—forced circulation
(2) Oil	(a) Steam—pipes—4 types
	(b) Hot water—pipes—3 types
	(c) Warm air—metal ducts
	(d) Unit heaters—forced circulation
(3) Natural and artificial gas	(a) Panel heating—radiant
	(b) Unit heaters
	(c) Warm air—forced circulation
(4) Electrical resistance	(a) Panel heating—radiant
	(b) Unit heaters

Automatic Controls

Automatic heating is necessary where minimum temperatures are required and twenty-four hour attendance is not possible.

In cases where steam boilers or hot water boiler systems are in use the control of such plants is made possible by the use of pressure-actuated damper regulators for steam units and thermally acting units for hot water boilers so that excessive pressures and temperatures do not lead to dangerous operating conditions. All hand or stoker-fired coal, oil, gas-burning and electrical heat producing units must have a system of automatic controls to insure their proper functioning. The same is true in heating systems where there is mechanical circulation of hot water or warm air. Automatic controls of various sorts in heating systems are a necessity from the standpoint of safety, human comfort, proper functioning of the apparatus and economy of operation.

The most common types of automatic controls in use at this time are:

(1) Pressure
(2) Thermostat
(3) Electronic eye
(4) Liquid level

Thermostats control the output of steam and hot water radiators, unit heaters, ventilators, air conditioners, central fan heat diffuser plants, circulators of hot water systems and mechanical warm-air furnaces. They regulate the burning of fuel in steam and hot water boilers, gravity-flow and forced circulation warm air furnaces and direct-fired unit heaters as well as electrically supplied radiant heating systems.

Fuels

In most cases the geographical location and the availability of a particular kind of fuel determines the type of plant that is required. Your committee will furnish here some statistics on the modern trend away from the use of coal to an ever-increasing use of oil and gas. According to U. S. government figures, the use of coal for heating has decreased from 559 million tons in 1945 to 413 million tons in 1957. Coal used by railroads only has decreased from 125 million tons in 1945 to 8.4 million tons in 1957. On the other hand, the use of distillate and residual fuel oils has increased from 490,000 barrels per year in 1950 to 669,000 barrels in 1957, and the production of natural gas has shown the greatest increase of any fuel as the production has increased from 4.3 billion cu. ft. in 1950 to 7.8 billion cu. ft. in 1957. As far as the railroads are concerned, heating with electricity is very limited due to excessive costs, although in some areas where a governmental agency is producing electrical power the rates are much lower, but still not enough to induce them or other industries to use it as a means of heating.

In summary, your committee has found the fuel consumption picture is as follows:

(1) The use of coal for heating buildings of all sizes is decreasing rapidly in spite of a drop in cost in some locations. Coal mining areas are resisting this trend.
(2) The use of fuel oil is likewise decreasing but very slightly. In this case the cost of handling, boiler maintenance and the ever-increasing cost of the fuel itself are the factors that hold down the use of this type of fuel.
(3) The use of gas has increased tremendously in the past 10 years due to much lower maintenance costs, clean and quiet operation, no handling costs or storage space needed. In a number of areas where gas is not yet available, fuel oil is very popular.
(4) The use of electricity for any type of heating at the present time is practically prohibitive because of the excessive cost referred to herein.

Heating With Steam

The present-day types of steam heating are one-pipe air vent, one-pipe vapor, two-pipe vapor, and vacuum systems. One-pipe installations have, at the bottom of each heat-dispersal unit, a single-pipe connection through which the supply of heating steam and the removal of the resulting condensate is made. Two-pipe systems have separate inlet and outlet connections to each heat diffuser, and the problem of the counterflow of steam and condensate is not so involved as it is with a one-pipe system.

In gravity systems the flow of condensate through the return piping into the boiler is produced as indicated by this term, and no pump of any sort is required to handle it. Mechanical systems employ either a condensate pump or a vacuum pump to force the returned condensate either into a boiler or a feedwater heater. When gravity return of condensate is made to a boiler, all radiators and the ends of all supply mains must be properly located above the level of the water in the boiler. Vacuum systems are of necessity two-pipe mechanical systems. All others enumerated may be operated with either gravity or mechanical return of the condensate. Any of the systems listed may be installed with basement mains allowing the steam to feed upward through risers to the radiators of the building or with overhead steam mains which supply steam to risers carrying downward through the structure.

Quite frequently in cities and about large institutions a single or multiple boiler plant to furnish heat to a number of buildings is more feasible and economical than having boiler equipment in each building. The vehicle used to carry heat to each building may be either steam or hot water. Water, although used to some extent, is not as easily handled as steam as it must be pumped. The steam delivered by the boiler plant may arrive at the point of use at either high or low pressure. In most cases the amount of

steam purchased from the central heating plant is usually measured by means of a condensation meter.

The fully automatic steam generator requires better conditioning of the boiler make-up water than does the conventional cast iron or steel boiler. The internal type water treatment may be used with water of comparatively low hardness. However, zeolite treated water or de-ionized water is recommended for locations where the water is high in scale-forming solids. In addition to the zeolite softener, supplementary treatment consisting of a phosphate to scavenge any hardness which may slip through the zeolite bed, and an organic material to condition the sludge and control pitting and corrosion is recommended.

If pitting of steam lines and condensate return lines is a problem, then an additional chemical treatment consisting of a filming-type amine is recommended. The amine treatment coats all inner surfaces of the pipe lines and is quite effective in preventing metal loss.

Proper water treatment will pay for itself many times over in prolonging the service life of the boiler, reducing fuel costs by keeping heat transfer surfaces clean and reducing maintenance costs which may result from deposits of scale and sludge in the boiler feed pumps and operating controls.

In summary, the commonly used steam heating systems are classified as follows:

(1) One-pipe air-vent system—gravity.
(2) One-pipe air-vent system with condensate pump added.
(3) Vapor system.
(4) Vacuum system.
(5) Differential-vacuum system.

Heating With Hot Water

The use of water as a heat-carrying medium serves structures such as yard offices, small shops and other buildings used by railroads. Water has an advantage over steam in that its temperature may be easily regulated automatically according to weather conditions so that air temperature control within rooms is thereby facilitated. Heating with hot water is divided into three main types; single-main gravity up-feed, two-main up-feed and overhead down-feed. The perfection of the one-pipe forced-circulation system and its many advantages over gravity flow when a single main is used have practically eliminated the gravity system from consideration for new installations, though many systems of this type installed in years past are still functioning. The two-main up-feed systems differ from the one-pipe up-feed systems in that a separate return main is provided. The return is not mixed with the supply water so that the supply water is not cooled as rapidly in the main. The overhead down-feed systems have an overhead or attic supply main and a basement or low level return main. The heated water is carried directly from the heater by means of a main riser to the overhead pipe space.

Hot-water heating by use of electrical energy: Space heating by drawing on a supply of electrical energy at any time is likely to prove to be very expensive unless light loads are involved and the cost of the power supply is relatively low. Present-day electrical heating equipment includes electrically operated portable steam radiators, unit heaters, and direct radiant heaters using either luminous or non-luminous resistance coils.

Heating With Warm Air

The warm-air furnace heating system is suitable for buildings such as yard offices, car repair buildings, or small structures having dimensions which will permit the circulation of air to and from a fuel burning heater.

Automatic or semi-automatic warm-air furnaces are generally lower in initial cost than steam or hot-water plants. They possess flexibility of operation as they begin to function almost immediately after a fire is started. The operating costs compare favorably with other systems. The temperature of the air entering rooms is adjustable to weather conditions, and recirculation of the air through the furnace is an aid in securing uniformity of air temperature.

The gravity systems are less noisy as far as the air circulation is concerned, and both the first cost and the maintenance cost are less with this type of warm-air system. However, gravity flow systems have certain disadvantages which are not present when the air-circulation is forced by means of a blower. Structures more than 40 ft. square and more than three stories high are not suitable for a gravity flow system. The furnace occupies considerable space and requires a central location because the leader ducts should be limited to lengths of 10 or 12 ft. Leader ducts cannot run through unheated spaces unless they are very well insulated. Gravity systems require larger ducts for carrying the air to and from the furnace. Because of the lower velocity of the air circulation in gravity systems, heat transfer from the furnace to the moving air is not as good, and a greater portion of the heat absorbed from the furnace is lost between it and the warm-air registers. Forced circulation warm-air systems which are equipped with devices for adding water vapor to the circulating air are often referred to as winter air conditioners.

Warm-air furnaces designed for the use of either oil or gas alone do not include grates and are often quite different in their construction than those built for the use of coal only. The differences in design lead to more efficient transfer of heat from the products of combustion to the circulating air in the furnaces built for the exclusive use of either oil or gas, and also less consideration has

to be given to the accessibility of their heating surfaces for cleaning operations.

Central Fan Heating

The scheme of heating which requires a fan, heater units, and a duct system is termed a hot blast system. This form of forced convection, indirect heating differs, for the most part, from mechanical warm-air furnace systems in equipment used for warming the air. The heat-conveying medium used within the heater sections is either steam or forced circulation hot-water, although steam is perhaps the more common of the two.

Radiant or Panel Type Heating

A heating system may be classified as panel-type or radiant heating when the medium, such as electricity, water, steam, hot water or air, is circulated through wires, pipes or ducts and the heat is transferred by radiation to objects and surfaces within a room.

The advantages of panel-type heating are as follows:

(1) The heat diffusing elements are completely out of sight and do not interfere with any desired placement of equipment, furniture or floor covering.

(2) As the panels are incorporated in the structural frame of a building, the heating plant may be started as soon as this portion of the construction has been completed, thus facilitating the completion of the interior work when construction is being performed during cold weather.

(3) The panels are so arranged that it is impossible to throw the system out of adjustment by moving valves or dampers.

(4) Air currents within a room heated by these panels are of lower velocity than in rooms heated by conventional systems with the result that dust-collection, streaking of walls, etc., is greatly reduced and cleaning and painting is reduced considerably.

The disadvantages of panel type heating are as follows:

(1) Due to the heat storage in the large panels, which are used as heat diffusers, the problem of maintaining uniform temperatures within a room through rapid changes of outside temperature is usually more difficult than with other heating systems.

(2) The panels are incorporated as an integral part of the building structure and the repair of leaks which may develop after the system is placed in service can be very expensive.

(3) This panel type of heating does not offer the possibility of supplying outside air for ventilation of the room or building.

Space Heating

Atmospheric gas-fired infrared heaters provide a means of transferring heat from a source to a point where it is needed without heating the intervening air and without any transfer medium. This type of burner, operating under atmospheric pressure, has been developed as an efficient source of radiation.

This type of burner now has many applications in a wide variety of industries. For example, an eastern railroad is presently using portable units consisting of a 20-lb propane tank and heating unit of 16,000 Btu which they have used for thawing frozen water lines under buildings, furnishing heat for men required to ride in the back of trucks on emergency trips of up to 200 miles, also spot-heating for mechanics required to work in the field.

The cost of this unit is less than $100.00. The 20-lb tanks of gas will operate for 26 hrs and the cost of the gas is about $2.40 per tank. The cost of 100-lb tanks is about $7.50.

They have also installed infrared heaters in a car repair shop, a building having some 800,000 cu ft of space. The heaters (28 of them) are of 48,000 Btu capacity and were installed at a cost of $10,000, including the cost of the heaters. Over a period of 6 months the cost of operation of these gas-fired heaters has been $506.00 per month or $18.00 per unit. This eastern railroad feels that these infrared heaters are considerably more economical to operate and maintain than the previous steam system.

Low-temperature infrared generators, such as radiant panels, hot water or steam radiators, low-temperature electric coils or combustion chambers or heaters, have many applications in the heating field, but a comparatively small part of the heat transfer takes place by radiation and large surface areas are required to obtain any considerable radiant output.

High-temperature electrically heated infrared lamps are very efficient sources of short-wave infrared and have many applications in the industrial-processing field. However, where large quantities of heat are required, their use is often limited by the cost of power or of the electric lines, transformers and equipment required.

Gas can be used as a fuel to heat bodies such as ceramics or certain temperature-resistant metals to a high enough temperature to give off large amounts of infrared radiation, and at usual gas rates may provide the most economical source of radiant heat.

Another railroad is using a type of gas-fired burner which generates infrared radiation without the use of compressed air. This generator was invented in a foreign country and is now being sold locally. These burners have many applications in industries. Several of the burners can be combined into a space heater. Each such unit has a safety pilot or electric igniter and is generally equipped with thermostatic control.

While the heat input must balance the losses, there are substantial savings in operating costs over convection systems, owing in part to the following factors:

(1) The air temperature maintained is lower; hence losses due to air change and through the surfaces are lower.

(2) There is a lower heat gradient from floor to ceiling, which reduces losses from the upper part of the room.

(3) The heaters can be spotted where heat losses are greater or where heat is most required, reducing the average temperature in the building.

(4) By using a number of thermostats, the heat input is supplied where the heat is needed; hence one section is not overheated to maintain comfort at another point.

Use of these heaters over the past few winters showed large savings in heating costs over other systems previously used, as well as in comparison with costs calculated by usual methods.

Infrared heaters have many applications other than for space heating. One of the most successful adaptations is for thawing frozen material. There are numerous installations for thawing cars of coal, ore, limestone and other materials which must be handled outdoors in freezing weather. Thawing is accomplished by passing the cars between cabinets containing many of the infrared generators, the radiation from which is directed onto the sides of the cars. Sometimes additional heaters heat the top, bottom and ends.

To achieve the required dumping capacity in coldest weather, sheds are built to thaw a number of cars simultaneously. The number of heaters and their arrangement depends on the type of material, the dumping rate, the type of car and the severity of the weather.

Where gas (natural or synthetic) is a low-cost fuel, savings with some type of infrared heating can be substantial. Operating costs are reduced by elimination of boiler room labor. A 25 per cent savings over conventional heating methods is common. Gas radiant heating provides the heating engineer with a superior tool for many applications, which is evidenced by the large number of very satisfactory installations.

In the matter of space heating employing the use of electrical energy, it has been found that in most areas the cost of electricity makes the use of this source of energy quite expensive and therefore most industries are installing the gas type of infrared heaters.

Summary

In conclusion, your committee has evaluated all the information gathered from various sources and its members on the subject of automatic heating and submits the following:

(1) The purchase of steam from a central heating plant is very economical and space saving in cases where a fairly large building is to be heated and the supply is available. A large mid-western railroad is presently heating its general office building (a 10-story structure) by this method. The steam purchase bills for a twelve-month period average $1,341.00 per month. The building has approximately 120,000 sq ft of usable space. No boiler room nor oil or coal storage space is required. Also, no boiler maintenance personnel, etc., is needed. The initial cost was for pipes and radiators only; the service life of the steam distribution system is probably in the range of 50-70 years.

(2) The cost of installing an automatic steam heating system in a new building of nominal size is approximately 11 per cent of the total cost of the structure itself or about $24.00 per 100 sq ft of radiation. The operation and maintenance costs are usually relatively high and the service life is 25-35 years.

(3) The cost of installing an automatic hot-water heating system in a new building of nominal size is about 9 per cent of the total cost of the structure itself or about $18.00 per sq ft of radiation. The operation and maintenance cost for this type of heating is less than for a comparable steam plant and the service life is approximately 30-40 years.

(4) The cost of installing an automatic warm-air heating system in a new building of less floor space than considered in items (2) and (3) above runs about $1.25 to $1.75 per sq ft of space heated. The operation and maintenance costs will vary greatly with type of burner used, forced or gravity system, oil or gas, etc. The service life would depend on the type of burner installed, perhaps 25-40 years.

(5) The cost of installing radiant or panel-type heating in a new building where the heat is carried to floors, walls or ceiling by the use of pipes or ducts and it becomes a part of the structural system of the building, is usually a bit higher than other installations, but it has advantages which have already been discussed. The operation and maintenance costs would compare favorably with other systems, as would the service life.

(6) The cost of installing an automatic space heating system in a new building, such as diesel shop, car repair shop or other type of railroad structure, is presently estimated to be between 5 per cent and 7 per cent of the total cost of the structure. When gas is used as a fuel, the operating cost is usually less than for other types of heating, and maintenance costs are very low. The service life of this type of heating system is comparable to most other types of heating systems now in use throughout the country.

Annual Programming of Bridge and Building Work

Report of Committee

COMMITTEE—JOEL W. DEVALLE, *Chairman,* engr. br.-sys., SOU., Washington, D. C.; R. R. GUNDERSON, *Vice-Chairman,* engr. m. of w., WM, Baltimore, Md.; H. J. LIESER, *Vice-Chairman,* supvr. b. & b., C&WI, Chicago, Ill.; H. A. BOEHLING, JR., supvr. b. & b., C&O, Richmond, Va.; J. A. CAYWOOD, engr. m. of w., B&O, Baltimore, Md.; G. S. CRITES, dist. engr. (ret.), B&O, Baltimore, Md.; R. L. FOX, proc. engr.-struct., SOU., Washington, D. C.; E. F. GARLAND, br. supvr., NEW ORLEANS PUBLIC BELT, New Orleans, La.; J. M. GILMORE, meth. engr-b. & b., NYC, New York, N. Y.; C. E. HELMLE, asst. to ch. engr., T&NO, Houston, Tex.; W. R. HYMA, asst. engr., AT&SF, Chicago, Ill.; T. E. JACKSON, gen. b. & b. supvr., SP, San Francisco, Calif.; H. F. LUCAS, asst. engr., CMStP&P, Chicago, Ill.; J. W. N. MAYS, asst. engr.-sys., PRR, Philadelphia, Pa.; W. R. MEEKS, b. & b. supvr., MP, Falls City, Neb.; J. L. PERRIER, div. engr., C&NW, Chicago, Ill.; A. C. PRICE, b. & b. mast., CPR, London, Ont., Can.; V. D. RAESSLER, supvr. b. & b., IC, Memphis, Tenn.; H. S. TALMAN, gen. supvr. b. & b., C&O, Richmond, Va.; C. L. TANNER, gen. fore., b. & b. and w. s., P&SF, Slaton, Tex.; O. R. WOLD, b. & b. supvr., NP, Spokane, Wash.

J. W. DEVALLE
Chairman

Bridge and building work is susceptible to proper and orderly planning, just as are other railway functions. Actually, in certain areas, such planning can be based on predicted needs with more precision than most other railway maintenance. Lack of adequate planning and programming of this expensive work results in waste of effort, materials and money, and usually does not result in a balanced maintenance effort and due attention given to the most-needed work.

Good annual programming is based on a thorough assessment of the condition of all fixed property, a determination of the requirements of the maintenance to be performed on such property, "weeding out" of unnecessary maintenance, and careful planning of the remainder of the work to insure accomplishments in the most economical manner and at the appropriate time.

Some of the advantages to be gained from annual programming are as follows:

1. To avoid haphazard maintenance work where first priority work is delayed to permit accomplishment of less urgent work.
2. To permit more control of the work being done in the field, by elimination of requests for work not actually necessary, such as repairs to facilities soon to be retired.
3. To afford a plan for purchase of materials which will eliminate excess stocks, reduce inventories, assure correct deliveries at the proper time, minimize waste of labor and materials in field cutting and trimming.
4. To bring modern assembly-line maintenance methods to the jobsite through the use of specially trained and equipped gangs, each employing maintenance procedures developed through intensive studies.
5. The use of gangs, best equipped and qualified for specific tasks, will minimize duplication of costly equipment and tools with a consequent reduction in their maintenance and replacement.
6. The use of specialized gangs, each assigned to specific types of work, and with a minimum personnel roster, can minimize waste of excess labor which sometimes results from the use of large gangs on small tasks.
7. To obtain better workmanship and materials at lower cost.
8. To afford management with an advance estimate clearly showing recommended annual maintenance expenditures in terms of labor and materials as well as an outline of proposed capital and maintenance expenditures.
9. Finally, to afford the supervisory officials a continuing appraisal of of the work being accomplished, and

a gauge as to the progress and efficiency of the organization.

The sum total of the benefits listed above can be obtained if the program is conscientiously prepared and executed. Both preparation and execution are important, and both require continuing supervision. It is obviously wrong to prepare a haphazard program with poor or faulty planning, and it is equally wrong to entrust the execution of a well-planned program to subordinates who may twist it to fit their own ideas of maintenance, for efficiency can only be gained as a result of intelligent planning and execution.

The mechanics of preparation of a program are not difficult—they are complicated, and require good judgment and experience, but can readily be resolved by a supervisory officer worthy of the designation. The criteria listed below are generalized and may well require minor modification to suit specific problems, but they are all desirable if you are to have successful programming.

First of all it is necessary to gather all information regarding maintenance work to be included in the proposed program. This can only be accomplished by complete, detailed, physical inspection of the property to determine actual needs. Since a companion report on the subject of Bridge Inspection Procedure by B&B forces is also to be presented at this meeting by Special Subjects Committee 3, this report will confine its remarks regarding inspections to those considered appropriate to preparation of a work program.

The inspections necessary to form a basis for an annual program should be accomplished during the previous year, not less frequent than semi-annually. They should always be performed by supervisory personnel who are well qualified. Obviously it would be unwise to have a program calling for expenditures of the amounts involved based on recommendations of an individual who did not represent management, and it would be equally foolish to rely on the judgment of a supervisor not experienced in the particular field.

For example, there are countless good bridge supervisors whose long experience with timber structures has sharpened their judgment in this regard, but these same supervisors might be less than adequate in knowing inherent weaknesses and incipient trouble spots in steel structures. In such cases, these supervisors should be accompanied by engineers who are qualified to assist and instruct them in proper inspection procedures. Of course, the supervisor must be furnished sufficient assistance to accomplish the physical work of sounding timbers, measuring, excavating, motor car operation, etc., but the important requirement remains that the inspections be made under the direction of a supervisory officer.

On the first of the two semi-annual inspections the supervisor should make a thorough detailed inspection of each structure, carefully noting any deficiencies he considers necessary to correct during the coming year, together with a list of the material required, and any special equipment or tools needed to effect the repairs. When he leaves the structure, he should have a written record of his opinion of its maintenance needs for the forthcoming year, without attempting to "remember" until the end of the day when he might compile his notes.

When the supervisor has completed his inspection he should furnish a composite list of the work he proposes to his district supervisory officer (which may usually be designated as roadmaster, division engineer, etc.) for review and subsequent forwarding to the regional or chief engineer. All of the composite lists should be assembled in that office, compiled, and tentatively reviewed for completeness of coverage and any unusual circumstances or recommendations. This procedure will result in an overall maintenance program which contains all of the recommendations from field officers for maintenance work for the ensuing year. The regional engineer should at this time incorporate in the listing all of the known AFE work which can be predicted.

Because it is a well known fact that some maintenance officers have a tendency to over-emphasize their needs, a careful check of their recommendations should be made. This is best accomplished at the time of the second semi-annual inspection, when the supervisor should be accompanied by a qualified representative of the regional or chief engineer's office for the purpose of examining his proposed work. If in the judgment of this engineer, the requested work is timely and adequate and without excessive overstatement, it should be approved, but if the needs have been exceeded, the program should be accordingly reduced. The accompanying engineer will soon be able to form an opinion of the supervisor's judgment and reduce his portion of the second-half inspection to that considered appropriate, such as an occasional spot check at various locations. This is not to imply that the supervisor can limit his second-half inspection to an occasional spot check. He should make a second inspection of each structure in sufficient detail to assure himself that conditions previously noted have not deteriorated so as to require emergency action, and, in addition, that no new conditions have developed to warrant consideration in the next program.

The second step in the preparation of the program is for the regional or chief engineer to classify all of the work into various related categories, such as (1) building painting and roof coating, (2) timber trestle light repairs, (3) structural steel greasing or painting, etc. All of the work

under each category should be listed according to the following criteria: (a) Priority of need, (b) geographical location (the work should be so arranged as to permit a gang to progress along the line of road, rather than to skip from one location to another, and then retrace its path), (c) season of the year work is to be accomplished, and (d) frequency of transfer of machinery or work equipment across seniority districts. Some carriers faced with a multitude of small seniority districts might wish to place heavier emphasis on the latter criteria to avoid frequent displacement of personnel, but this is usually of minor consequence.

After the work has been classified, and programmed according to its category, and assigned to a gang, an estimate of the working time at each location can be made and totalled to arrive at the number of gang days required to complete each category. For instance, if it was estimated that the proposed amount of building painting would require 500 working days, and the weather only permitted such work on an average of twenty-six weeks throughout the year, then it would be necessary to either assign four such gangs, or curtail the work to that which could be accomplished. This same sort of reasoning should be applied to each work category to determine the total labor requirements for the ensuing year. From such total estimate, the labor cost can be estimated with a fair degree of accuracy.

The material requirements for the work proposed can be summed up in the various major classifications of bridge ties, other bridge lumber, such as stringers, caps, post, bracing, etc., paint or grease, steel quantities, etc., and turned over to the purchasing department for purchase. The very nature of the programming assists in this feature, for the purchasing department can place orders on solidly predicted needs as far as twelve months in advance, and receive the benefit of price reductions not only from competitive bids, but also from a reduction in the need for hurry-up purchases. The advance knowledge of material requirements, and arrangement for their scheduled deliveries, will also greatly expedite reductions in the carrier's material inventories. Material suppliers can base their bids on deliveries "spread out" more uniformly over longer periods with a consequent reduction in their inventories and handling costs, as well as in possible overtime production costs.

At this point in the process, the regional (or chief) engineer has a comprehensive idea of the cost of maintenance and capital expenditures which are desired for the ensuing year, and is in position to submit the proposal for management approval. His proposal, based on sound planning, and with full consideration of money which may be allotted to him will be approved by management. Generally, ordering of mass materials and any new equipment needed will have been delayed until management approval has been obtained.

The regional engineer's office should keep a record of the material ordered for each job and arrange with the purchasing department for delivery of this material to the job site at the appropriate time. This does not require a great deal of attention, but is an important item, and cannot be neglected. In actual practice, a daily or weekly inspection of the progress reports of the progress of the activities of the various gangs will be sufficient to predict the rate of use of the various kinds of materials.

Although not a direct function of this report, some mention might be made of the general character of specialized maintenance gangs referred to earlier, in order to illustrate their possible use in programmed work. The number and types of each should be chosen by each carrier to fit its specific needs.

1. Timber trestle light repairs. To perform deck and stringer repairs to timber trestles as well as steel bridges. One foreman and six men, to be equipped with special purpose hydraulic jacks for raising and lining decks, hydraulic bolt cutters and extractors, a machine with mounted drills and impact hammers and wrenches, chain saw, light on-off track crane or hoist, and truck.
2. Timber trestle light repairs. To replace caps, posts, bracing, blocking, etc. One foreman and four men, to be equipped with special-purpose hydraulic jacks, hydraulic bolt cutters and extractors, chain saw, power drills and impact wrenches, light truck mounted crane fitted for on-track travel, special purpose portable scaffolding.
3. Building repairs. To make all types of repairs to buildings, platforms and sheds. One foreman and four men to be equipped with truck and one of the modern carpenter trailers with bench and portable saws, power planers, appropriate jacks, power drills, etc.
4. Building paint and roof coating. To paint way stations, shop or office buildings, depots, etc., and rehabilitating roofs by spray-on type coatings. One foreman and three men, equipped with truck-mounted outfit featuring sprays for paint as well as sprays with heat exchanger for more viscous roof coatings, and having hydraulically operated boom with personnel cages to minimize use of scaffolding. Also appropriate lightweight ladders, drop cloths, etc.

5. Deck coating and bridge greasing. To spray and coat bridge ties and steel surfaces for protection from weather and corrosive influences of atmosphere and train operations. One foreman and three men with truck and commercial spray outfit with special scaffolding for reaching viaduct tower legs, undersides of structures, etc. This gang could be alternately equipped with appropriate tools for miscellaneous structural steel repairs during unseasonable weather when spraying would not be feasible.
6. Bridge or trestle construction. To perform heavy repairs or reconstruction of bridges or trestles which cannot be contracted. One foreman and six men, with truck mounted crane with detachable leads and diesel pile hammer, equipped for travel on or off track. Air compressor with impact wrenches, drills, jacks, power saws and allied equipment.

From the above general description of a few types of special purpose gangs, the pattern should be apparent. Maintenance practices vary between carriers and some of the above types may not be acceptable while other types may be required, such as fencing gangs, masonry repair gangs, steel painting gangs, etc. The important feature is the program and its execution.

There is an additional facet of programming which is worthy of note, and will bear mentioning. The supervisor in the field is, and rightly should be, best aware of specific needs of small supplies needed to accomplish his work. To this end, he should be given authority to make local purchases of certain materials which are not susceptible to ordering in large quantities. Such a practice promotes good feeling among merchants, particularly in small towns, and can result in actual economies if the supervisor exercises care and judgment in his purchasing. Hardware, nails, doors, windows, ready-mix concrete, dressed lumber, and allied materials are among those which might be purchased locally.

After the program has been approved, and work is progressing, the supervisors should make periodic, usually weekly, progress reports through their division officers to the regional engineer. Reports will be found to serve as a measure of the gang efficiency, but undue reliance should not be placed on this manner of supervision. Visitations to the gangs should be made by others than the supervisor to further determine if the equipment is in order, being used in the proper manner without abuse, and that proper levels of production are being maintained. No program will progress satisfactorily unless it is properly supervised, and proper supervision must be based on an overall knowledge of the extent of the work. The progress reports are also important, however, for as previously mentioned they serve as a guide to the scheduling of material deliveries.

The overall idea of programming bridge and building work is not new, since it is already in use on many roads. It represents the most thorough, workmanlike, approach if properly planned and executed. In fact, it is the only way of carrying out our work which we can justify to management. If you have no such procedure in use at present, a start in this direction should be made, even if in only limited applications at first.

Application of Prestressed Concrete to Bridges and Buildings

Report of Committee

COMMITTEE—A. I. ATKINS, *Chairman,* bldg. struct. engr., B&O, Baltimore, Md.; S. WHITE, *Vice-Chairman,* gen. b. & b. supvr., SP, San Francisco, Calif.; J. STILLSON, *Vice-Chairman,* gen. fore.-struct., PRR, Johnstown, Pa.; J. H. BABBITT, div. engr., B&O, Indianapolis, Ind.; J. N. BURKEL, drafts., MP, St. Louis, Mo.; M. H. DICK, vice pres. & ed., RAILWAY TRACK & STRUCTURES, Chicago, Ill.; T. L. FULLER, asst, engr. br., SP, San Francisco, Calif.; J. A. GOFORTH, maint. engr., CLINCHFIELD, Erwin, Tenn.; W. H. HUFFMAN, asst. ch. engr.-const., C&NW, Chicago, Ill.; C. A. KLEIN, br. maint. engr., READING, Philadelphia, Pa.; T. N. KHOURY, br. engr., AMERICAN MARIETTA, Chicago, Ill.; J. K. LYNCH, JR., sr. asst. b. & b. supvr., SP, Tucson, Ariz.; L. P. NICHOLSON, rwy repr., PORTLAND CEMENT ASSOCIATION, Chicago, Ill.; J. M. PETERSON, br. engr., CGW, Oelwein, Iowa; R. A. PINNELL, JR., pres., LIFT SLAB RESEARCH & DEVELOPMENT, San Antonio, Tex.; J. T. SCHOENER, asst. engr. struct., MP, St. Louis, Mo.; J. E. SCROGGS, mgr. r.r. dept., CARTER-WATERS, Kansas City, Mo.; W. L. SHORT, asst. engr., MP, St. Louis, Mo.; E. R. SIMMONS, b. & b. supvr., StLSW, Pine Bluff, Ark.; S. A. STUTES, asst. supvr. struct., T&NO, Houston, Tex.

Prestressed concrete is the product obtained by application of newly developed design concepts to familiar reinforced concrete construction. As such, it has evolved into an entirely new construction material utilizing most advantageously the inherent compressive strength and durability of quality concrete combined with the great tensile strength of high-tensile steel wires or strands and is recognized as being a new, great advance in construction.

This report will endeavor to define prestressed concrete, to enumerate primary advantages of its usage in construction, and to evaluate its functional applications to railroad bridges and buildings.

The ideal concrete beam is one in which no tensile stresses exist and which will not crack when loaded. The theory of prestressed design provides for elimination of undesirable stresses by building in artificial stresses to offset those caused by imposition of a load.

Prestressed concrete, in effect, is a form of reinforced concrete that is compressed during construction. Since the entire concrete section is subjected to permanent built-in compressive forces, such built-in forces counterbalance or cancel out normal tensile forces induced by a superimposed load. Furthermore, since all concrete is in compression, it is helping to support the working load. In addition, cracking of concrete is eliminated under normal loading.

The concrete is prestressed or "pre-compressioned" by stretching the steel reinforcement during construction. After the concrete has been placed and has hardened sufficiently, the steel is gradually released and the elastic tendency of the steel to snap back to its original length compresses the concrete.

There are two basic types of prestressing: (a) "pretensioning," which is most adaptable to plant operation and (b) "post-tensioning," which is usually an on-the-site procedure.

In the pretensioning process, high-tensile steel wires or cables, usually from ¼-in to 7/16-in. in diameter, are stretched by jacks prior to casting of the concrete. Concrete is placed and cured and then the stretched steel is released to compress the concrete by means of the bond between the steel and the concrete.

In the post-tensioning procedure, steel wires (or large diameter rods or bridge cables) are encased in tubes and remain relaxed until after the concrete cures. When the concrete has attained sufficient strength, the steel wires are stretched by hydraulic jacks, ends of the wires being anchored against the concrete by attached steel anchor plates. Pressure of the anchor plates compresses the concrete.

There are many advantages conjunctive with the use of prestressed concrete—all of which are of importance. Primarily, however, economical use of high-strength concrete is made possible, thereby permitting, with no sacrifice of strength, construction of lighter, shallower concrete structures with longer spans. This results in savings of materials. Reduced depth of beams and slabs afford greater underclearance. The lighter weight and longer spans require fewer supports, thereby effecting savings in foundations and piling. Further, prestressed concrete is virtually crackless concrete. This is conducive to greater durability and reduced maintenance, especially under extreme conditions of exposure.

Prestressing also readily lends itself to prefabrication which places it in the class of factory-produced material, permits tighter quality control, reduces costs through repeated use of the same casting equipment, affords relief from extensive supervision and inspection, and results in savings in time and labor required for construction and erection. Fabrication is done faster in plants with trained plant labor. If the casting yard is

under cover, operations can be carried on in weather that would stop on-the-site pouring. Factory-line production methods also insure delivery of prestressed concrete members in step with work schedules.

One disadvantage of factory production is that members must be transportable. Since long and heavy pieces must be transported to the construction site, span lengths and weight of materials are limited by available transportation facilities. Generally, transportation problems for spans up to 40 ft are not too difficult, but increase with length up to about 70 ft. Span lengths of over 70 ft will make post-tensioning at the site more desirable.

Like any other building material, prestressed concrete can be adapted for use in constructing almost any type of structure. It can be and has been used for bridges, all structural elements of buildings, piles, caps, sheetpiling, water tanks, pressure pipe, piers, lift-slabs, poles, and other structural forms. Precast, prestressed units are especially advantageous for marine projects in that forming over water is eliminated and fewer bents are required because of longer spans.

However, lacking the know-how, skilled personnel, and necessary equipment, in general, it is doubtful if any railroad is capable at this time of economically producing its own prestressed products. Manufacture of prestressed concrete is a skilled science requiring services of specialists and special equipment.

Mixes for prestressed concrete structures are so dry that there is little or no slump. Such concrete must be "cast" rather than "poured," and must be continuously placed to prevent setting up too quickly. Controlled internal and external vibration is required to completely fill the forms. Proper curing is necessary to prevent crazing, shrinkage, and excessive drying of concrete.

The prestressing steel must be carefully handled to avoid damage by physical accident or corrosion from dampness or weather. High-tensile prestressing strands should be stored under cover or inside a building and reel stands are desirable to facilitate handling. Strands cannot be misplaced or jammed and must be adequately anchored during the pretensioning operation. Various methods of anchorage and spacing of wires and strands present many difficult problems. Also, due to extremely high tensions applied to the steel by hydraulic jacks, prestressing procedures may become hazardous.

To present this report in as comprehensive a manner as practicable, a questionnaire was sent to bridge and building engineers and supervisors representing railroads located in every section of the United States. The questionnaire solicited information about existing prestressed concrete railroad structures. Personal opinions of users and non-users were also solicited. Results were unusually good—67 returns were received from people associated with 54 railroads and opinions were many and varied.

Railroads have used prestressed concrete in girders and beams and slabs for overhead highway and railroad bridges, for piles, pile caps, building foundation walls, snow sheds, and retarder towers, and for slabs and beams and girders for roofs and floors of buildings. One company is investigating use of prestressed concrete for tunnels.

Currently, prestressed concrete is finding its greatest utilization in railroad bridges.

As part of a research program initiated in 1954 by the Association of American Railroads, the first railroad bridge in this country employing prestressed concrete was installed on a main line track in Missouri. From the questionnaire and other sources, it was learned that 14 railroads now boast of 26 prestressed concrete railroad bridges at 17 different project locations. Under plans for construction this year are bridges at four additional locations and this will bring the list of users to 16 railroads. Furthermore, eight other railroads are presently studying prestressed concrete for contemplated bridge usage in the near future.

Two significant facts are of particular interest. As would be expected since humid climates have deleterious effects on steel structures, southern and southwestern sections of the country predominate in ownership; however, other sections are also well represented. This tends to prove that prestressed concrete railroad bridges are not indigenous to any one section of the country. Also, except for the initial structure, all existing bridges have been built within approximately the last three years.

The majority of existing prestressed concrete railroad bridges are multiple-span trestles with relatively short spans. For obvious reasons, this trend will doubtless be continued. The typical multiple-span, prestressed concrete trestle consists of a three-pile bent or pile abutment using hollow core prestressed piles, a conventional poured-in-place pile cap, and a precast deck composed of two identical prestressed slabs or prestressed box beams. These structures can be constructed with great simplicity and little interruption to traffic by railroad forces using equipment owned by most railroads. Prestressed units offer many desirable features; namely, light weight, facility in handling, durability, freedom from cracks, low maintenance costs, and resistance to fire.

One railroad, desiring a ballast-deck superstructure which could be set with minimum interruption to train traffic, built a bridge in Ohio consisting of five 30-ft long, 30-in deep by 36-in wide prestressed concrete box beams. Predominant reasons for selecting this type of structure were speed of erection, depth restrictions, and economy.

A single-track bridge in Maryland has two

42-ft long tail spans with skewed ends each made up of four 48-in deep by 42-in wide prestressed concrete box beams. Prestressed spans were decided upon because of being economically practical, plant fabricated members being under better quality control, and indicated maintenance costs being very low. Cost in place, including prestressed members, precast concrete curbs and sidewalks, handrails, and bituminous paving, approximated $330 per linear foot of track.

In California, a two-span, five-track bridge consists of 19 prestressed box girders per span, each girder being 38 in deep, 48 in wide, and 35 ft long. Cost per girder erected was about $1,500. Cost per linear foot of girder in place amounted to about $820 for the five-track structure.

In keeping with a policy of upgrading its property to reduce future maintenance, a southern railroad decided to substitute a concrete structure for an existing bridge composed mainly of timber trestle that had reached the end of its service life. Extensive studies of comparative designs and cost estimates resulted in construction of a double-track, 703-foot long prestressed concrete trestle. Bents of three prestressed concrete piles were used with a deck consisting of four identical slabs, each 25 inches deep by 6 feet 9 inches wide. Slabs were detailed to permit casting both inside and outside slabs with the same forms. Prestressed curbs were cast separately and anchored with dowels to the outside slabs. Span length of 20 feet was adopted as being the most economical and best suited to permit placement of slabs with company owned equipment; also, to avoid interference with old bents. The trestle was built by regular railroad forces at an estimated saving of approximately $60,000 over use of conventional precast concrete.

Faced with a similar situation, a western railroad constructed a 100-ft. long, single-track, prestressed concrete trestle consisting of bents of three prestressed concrete piles, standard pile caps, and a deck of five prestressed box girders. Physical conditions at the site required span lengths of 25 ft and use of prestressed concrete stringers permitted sections sufficiently shallow to suit the waterway area and light enough to permit erection with company owned equipment. Erection was undertaken by railroad forces on same alignment as original structure while traffic was maintained.

An ambitious program involving prestressed concrete bridges was recently completed by a southwestern railroad. In connection with a nine-mile line change, six single-track and double-track prestressed concrete bridges, of span lengths of 22 ft 6 in and 33 ft, were constructed. This construction consisted of two prestressed 36-in deep by 7-ft wide concrete slabs placed on 24-in by 30-in by 14-ft prestressed concrete caps supported by intermediate bents of four concrete-filled metal pipe piles and abutment bents of three such piles, caps being weld-connected to piling by means of steel plates cast in bottoms of caps.

Since this project involved construction of trackage in a new location, track-mounted equipment could not be used without first laying new trackage to each bridge site. Due to other construction problems and to delays in construction which this procedure would have caused, plus the fact that the railroad did not own any off-track equipment, the project was progressed on basis of a general contractor constructing the bridges with off-track equipment. Final completed cost, exclusive of ballast and track, averaged $150 per track-foot.

To this point, the discussion has dealt almost exclusively with bridges consisting of precast, pretensioned slabs or box beams. At present, this type of structure appears to be more practical; therefore, it predominates. However, usage of pretensioned I-beams and other shape girders or of post-tensioned bridge members is by no means ruled out.

In a Texas project, two railroad bridges consisting of prestressed, pretensioned 44-in deep I-beam girders with spans of 46 ft and 67 ft were recently constructed. A six-inch composite deck was used with the girders. At time of construction, design choices were limited by available headroom and by available girder dimensions.

Primary reason for selection of prestressed girder construction was that preliminary designs and cost estimates indicated substantial savings over a design for steel girder bridges, part of the savings coming from economy of prestressed concrete construction and even a greater part accruing because highway girder forms on hand could be modified for railroad loading, thereby saving the railroad the cost of special forms.

The one excursion into the realm of post-tensioned railroad bridge girders involves two bridges, each with two 70-ft spans, built in Colorado in cooperation with the federal government. Four T-shaped girders, each 71 in deep and weighing 60 tons, were used for each span. Precast girders were preferred to cast-in place girders because they could be easily fabricated on the ground rather than on high formwork. Prestressed concrete was selected to allow a lighter member and the shallow girder depth minimized amount of grading necessary to obtain proper road clearance.

To construct these girders, a concrete-batching plant was set up at the site and casting beds and forms were constructed. Draped cables were positioned in flexible metal conduit and specially mixed concrete was placed and vibrated with special equipment. After curing of concrete, cables were tensioned by hydraulic ram-jacks according to a predetermined pattern and anchorage effected. Thereafter, metal ducts enclosing

cable tendons were blown clean by compressed air and ducts were pressure grouted with a pump.

Prestressed concrete piles are a self-contained subject. They have been used by many railroads. It is claimed that prestressed piles have proved to be superior in every way to conventional precast piles and therefore, have been adopted as standard for all concrete trestles or all bridges where concrete piles are used.

Prestressed piles can sustain lateral and handling forces which impose bending stresses and their freedom from cracks makes them better resistant to corrosion. Being lighter in weight, handling and driving is facilitated. Their tough character enables them to be driven in extremely hard and rocky ground without pile damage experienced with ordinary precast piles.

A southern railroad reports that prestressed piles are more economical, easier to cut off, have a more uniform surface, and present a better appearance. This railroad made the change from precast to prestressed piles in 1957. In that year, precast 20-in octagonal piles cost $4.30 to $4.60 per lineal foot depending on lengths; whereas the price of 18-in square prestressed piles was $4.25 per lineal foot for all lengths. Cross-sectional area of the 18-in square pile is almost exactly equal to cross-sectional area of the 20-in octagonal pile. Price of 18-in square prestressed piles in 1960 is $4.07 per lineal foot.

Those railroads claiming that prestressed piles are more economical, admittedly, are situated in areas where there are several manufacturers of prestressed products and prestressed piles are easily obtainable at competitive prices. However, this is not true in all sections of the country. One mid-western railroad reports that prestressed piling costs about 30 per cent more than standard concrete piling.

The preceding discussion of application of prestressed concrete to railroad bridges is generally applicable to buildings as well. Obviously, however, since building loads are far less than the heavier static and dynamic bridge loadings, design, shapes, and application of prestressed members are completely different when used for building construction.

Today, prestressed concrete is being used in hundreds of buildings all over the country. Often, an entire floor or roof of prestressed concrete is cast on the ground and raised into position with hydraulic jacks. In some buildings, every structural element, from foundation beam to roof, is composed of this material. With but few exceptions, however, practically the entire usage of prestressed concrete for railroad buildings has been confined to roof and floor systems; although there have been several unique instances where the material has been used for complete structures.

One such case involves construction of a retarder tower with all structural elements, except the foundation, being precast, prestressed slabs. Vertical slabs form a T-shaped pylon. Haunches on the pylon stem support the precast floor of a glassed-in room. The precast roof is cantilevered from the back wall. A five-man crew completed the structure in 16 hours. It was estimated that a structure of similar dimensions and constructed of lightweight blocks would have cost approximately the same as the prestressed structure.

Recently, a western railroad replaced some timber snow sheds with prestressed concrete sections consisting of two sidewall sections and roof beams. Situated in a heavy snow area, the units were designed for a snow load of 225 lb per sq ft on span lengths of 18 ft for a single track shed and 34 ft for a double-track shed. The sections were quickly and easily erected on a concrete base and are considered to be highly satisfactory. Based on life expectancy ratio of two and one-half to one, annual cost is about 10 per cent to 20 per cent higher for the prestressed structure than the timber shed. Although annual cost is higher now, prestressed sheds have the advantage of being fire-safe and cost thereof can be reduced in the future by wider use. Expected increase in cost of labor and materials required for timber sheds will also make prestressed concrete more competitive.

Generally, railroad buildings are designed to serve functional purposes and cost is of the essence. This factor explains the reluctance railroad men maintain toward using any new type of construction which may have higher initial cost. Yet, at least ten different railroads have used prestressed concrete for roofs and floors of buildings. One railroad reports that cost is competitive with steel, indicates satisfaction with prestressed members, and plans to continue to use them.

Concrete for roof decks is desirable and designers formerly supported it with exposed structural steel. Main handicaps of this procedure are cost of on-the-job forming, pouring and finishing, and limitations imposed by large amounts of material required for longer spans. Now obtainable are precast, prestressed units which provide concrete deck and beam built in one piece.

Prestressed concrete makes possible roof and floor members with longer spans, lower depth, and lighter weight. Deflection in members can also be accurately controlled through proper design. All of these factors result in savings in foundations, columns, and wall height and permit conversion of headroom into usable cubage.

The building construction phase of prestressed concrete has perhaps greater standardization than any other phase. The most widely used shapes are the double-tee, channel, single-tee, and I-beam. The I-beam is ideal for roof or floor girders for medium

to long spans. Some producers claim they can regularly compete against steel beams when the loading requires such a beam to weigh more than 60 lbs per sq ft.

The double-tee roof and floor joist is probably the most popular form of prestressed member made today and it has the most standardization of all. Members are usually four feet wide and the most commonly used span length is 40 ft. A 14-in deep joist will serve this length whether used for a roof or floor. Also, many interesting designs are accomplished by ability of the double-tee to cantilever.

Two of the less expensive roof systems used for industrial buildings are the bar joist-gypsum deck and the bar joist—metal deck systems. For spans of 40 ft or more, these systems will cost about $1.00 per square foot, excluding girders and columns. Prices for double-tees for spans from 30 ft to 50 ft will vary from 80 cents to $1.40 per sq ft, depending upon span length, loading conditions, and geographical location. For floor construction, and when a concrete roof deck is used with bar joists, prestressed double-tees are usually competitive on almost any reasonable span.

Designers have become disenchanted with restrictions imposed by cheap, short-span buildings. Today, more and more buildings are being built with fewer columns because of prestressed concrete. Longer spans, which incidentally increase cost advantages of prestressed concrete, permit maximum flexibility in building layout. Prestressed concrete members are readily available from the manufacturer and can be quickly erected, even during inclement weather, at a reduced cost of labor.

Exposed prestressed concrete roof and floor systems have a pleasing appearance which makes an acceptable ceiling for a great many structures. Hung ceilings are often eliminated at a very important cost savings. Sprayed on acoustical plaster or paint will provide all the finish required for many railroad buildings.

For spans which are not unreasonably short, prestressed concrete has great fire resistance compared to other competitive systems, thereby effecting a saving in insurance premiums. Prestressed concrete is maintenance free and is the ideal material for buildings exposed to weather or to corrosive shop atmospheres. Painting is not required to prevent the building from being dingy and unattractive.

When collateral advantages of prestressed concrete, such as competitive cost, longer spans with fewer columns, lower depth, lower wall heights, controlled deflections, increased usable cubage, availability of material, speed of erection, lower insurance premiums, and negligible maintenance, are considered, the competitive edge is definitely on the side of prestressed concrete for a great number of structures.

In reviewing personal opinions of railroad people who returned questionnaires, it is gratifying to note that an overwhelming majority favor usage of prestressed concrete for railroad structures, and are of the opinion thar it should be considered for most structures and included in all design studies.

Naturally, there were some negative responses to use of this new material. Mainly, apprehensions were expressed about creep, shrinkage, fatigue, deterioration of concrete, corrosion of steel, maintenance repairs, and economy. According to recognized authorities, creep, shrinkage, and fatigue need be of little concern as long as designs are based on American Railway Engineering Association specifications for prestressed concrete. Creep and shrinkage do reduce initial prestress; however, most designs are based on an assumed loss of 20 per cent which is more than will actually occur. Fatigue tests at a leading university concluded that as much as 50 per cent design overload can be permitted without causing failure in 1,00,000 cycles. This means that, if a bridge is designed for E-72 loading plus full impact, it could carry about E-100 loading plus full impact for 1,-000,000 times without causing failure.

Although few prestressed bridges of any kind are more than ten years old in this country, everything points to the fact that they will be virtually maintenance free. To date, surveys of prestressed bridges have shown that little or no maintenance has been required and no structure was in distress. In instances where highway bridges have been damaged by trucks, damaged areas have been successfully patched and nothing further has been needed. A prestressed member should not be expected to withstand catastrophic damage any more than a steel member under the same circumstances.

It is impossible at this time to present an accurate economic analysis of the use of prestressed concrete for railroad bridges. As yet, too few bridges have been constructed and physical conditions, methods of design and construction, availability of experienced contractors and prestressed products, means of transportation, and erection procedures vary with each bridge. It must also be pointed out that unit prices vary from place to place.

Today, there are well over 200 prestressed concrete plants proportionally distributed over the country and it is predicted that shortly there will be casting facilities to serve every city. During the past few years, economics of prestressed concrete have changed considerably due to more efficient means of manufacture resulting from competition of more prestressing plants.

Formwork is the one major item that works against the economy of prestressed concrete. To save concrete and steel, it is often necessary to use relatively complicated and expensive forms. To get an appreciable resultant saving, re-use of forms for a multi-

plicity of units becomes a principal consideration which can be accomplished only by standardization.

A definite effort is being made toward standardization of prestressed concrete members insofar as shape, depth, and length are concerned. In addition, standardization of pertinent details, such as expansion joints, bearing plates, expansion plates and shoes, anchor bolts, etc., are now being worked out by various technical societies. When standard sizes and shapes are adopted and can be produced regularly and carried in stock, cost of prestressed concrete members can be competitive with steel.

Initial cost of prestressed concrete, however, does not represent a true evaluation of the economy of the material. First costs should be broken down into annual costs when making cost comparisons of structures of different materials. With prestressed concrete, there is a definite savings on painting and maintenance costs. In addition, life expectancy of a prestressed structure can be considered to be much greater.

A western railroad prepared comparative estimates of costs for replacing an existing timber trestle with prestressed beams and alternate structures. Different designs were based on the use of steel, steel with precast concrete deck, prestressed concrete, and timber trestle. Initial cost of $357 per lineal foot for the prestressed concrete structure was less than that for all the alternates, except the timber trestle; however, life expectancy of the former is about two and one-quarter times that of the latter. On an annual basis the cost of the prestressed concrete structure approximates that of the timber structure.

Economics is not always the prime consideration in selecting prestressed concrete. Even when bids may be higher, prestressed concrete may be chosen because construction time often is less than that for steel, units are more easily available than steel units, and there is an estimated saving in painting cost. Moreover, the bridge might be at a special location where shallow depth, light weight, or other physical requirements dictate use of prestressed concrete.

One railroad reports that it can produce reinforced concrete in its own casting yard at much less expense than prestressed concrete purchased from manufacturers. Yet this railroad recently installed a bridge using 30-ft prestressed girders costing 70 per cent more than their own standard 30-ft slabs. The depth of the regular slabs ruled them out.

Within the next few years, a southwestern railroad anticipates being faced with a fairly heavy renewal program of its older existing timber structures. Since most of these structures are on single track situated in swampy terrain, new bridges must be built on the same alignment and whatever type bridge structure is decided upon must be installed under traffic conditions. This will rule out any field pouring of concrete decks; therefore, it appears that the slab-type, prestressed concrete trestle structure is the type that must be used. Economy requirements will necessitate use of short-span, prestressed slabs that can be handled by company owned, track-mounted equipment.

In summation, use of prestressed concrete for railroad bridges permits longer spans with increased underclearance and offers definite advantages in economy, availability of plant controlled units, speed of erection with minimum interruption to traffic, fire safety, pleasing appearance, and freedom from painting and maintenance. It must be stated that prestressed concrete is an addition to but not a replacement of conventional reinforced concrete. However, in cases where long spans and shallow depths are required, or for any other reasons that reinforced concrete is not suitable, prestressed concrete offers many new possibilities.

A great amount of prestressed concrete research is being conducted at universities with a view toward furthering the progress of this type of construction. Engineers are cooperating with producers toward the end result of eventual standardization and more efficient production methods. The time is fast approaching when standard prestressed concrete members may be secured from a handbook in much the same manner as steel beams are now secured.

Although the prestressed concrete industry is still new, railroads have already found useful application of the material for bridges and buildings. Further application will evolve with time and development of the industry.

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3rd V.-Pres.	H. M. Church	R. E. Dove	G. S. Crites	A. M. Knowles
4th V.-Pres.	R. E. Dove	F. H. Soothill	A. M. Knowles	N. D. Howard
Sec.-Treas.	C. A. Lichty	C. A. Lichty		
Secretary			F. O. Whiteman	A. G. Shaver
Treasurer			F. E. Weise	F. E. Weise
Directors	L. G. Byrd	B. R. Meyers	N. D. Howard	R. E. Caudle
	W. R. Ganser	W. Walkden	L. G. Byrd	I. A. Moore
	F. H. Soothill	A. S. Krefting	K. L. Miner	W. A. Sweet
	B. R. Meyers	A. M. Knowles	R. E. Caudle	J. L. Varker
	W. Walkden	L. G. Byrd	I. A. Moore	L. E. Peyser
	A. S. Krefting	K. L. Miner	W. A. Sweet	Martin Meyer

	1942-1943	1943-1944	1944-1945	1945-1946
President	G. S. Crites	J. L. Varker	J. L. Varker	N. D. Howard
1st V.-Pres.	R. E. Caudle	R. E. Caudle	R. E. Caudle	F. G. Campbell
2nd V.-Pres.	A. M. Knowles	N. D. Howard	N. D. Howard	J. S. Hancock
3rd V.-Pres.	N. D. Howard	F. G. Campbell	F. G. Campbell	E. H. Barnhart
4th V.-Pres.	J. L. Varker	J. S. Hancock	J. S. Hancock	W. F. Martens
Secretary	A. G. Shaver†	Elinor V. Heffern	Elise LaChance	Elise LaChance
	Lorene Kindred‡			
	Elinor V. Heffern			
Treasurer	F. E. Weise	C. R. Knowles	C. R. Knowles	C. R. Knowles
Treasurer Emeritus		F. E. Weise	F. E. Weise	
Directors	M. Meyer	W. F. Martens	W. F. Martens	A. B. Chapman
	L. E. Peyser	A. L. McCloy	A. L. McCloy	W. A. Huckstep
	K. L. Miner	L. C. Winkelhaus	L. C. Winkelhaus	F. R. Spofford
	F. G. Campbell	E. H. Barnhart	E. H. Barnhart	Guy E. Martin
	J. S. Hancock	A. B. Chapman	A. B. Chapman	B. R. Meyers
	L. C. Winkelhaus	L. E. Peyser	L. E. Peyser	L. E. Peyser

†To November 1, 1942
‡To February 1, 1943

	1946-1947	1947-1948	1948-1949	1949-1950
President	F. G. Campbell	J. S. Hancock	E. H. Barnhart	W. F. Martens
1st V.-Pres.	J. S. Hancock	E. H. Barnhart	W. F. Martens	W. A. Huckstep
2nd V.-Pres.	E. H. Barnhart	W. F. Martens	W. A. Huckstep	Guy E. Martin
3rd V.-Pres.	W. F. Martens	W. A. Huckstep	Guy E. Martin	F. R. Spofford
4th V.-Pres.	W. A. Huckstep	G. E. Martin	F. R. Spofford	Lee Mayfield
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	C. R. Knowles	C. R. Knowles	L. C. Winkelhaus	L. C. Winkelhaus
Directors	Guy E. Martin	H. M. Harlow	Lee Mayfield	H. M. Harlow
	B. R. Meyers	H. B. Christianson	F. M. Misch	V. E. Engman
	L. E. Peyser	F. R. Spofford	W. D. Gibson	G. W. Benson
	H. M. Harlow	Lee Mayfield	H. M. Harlow	F. M. Misch
	H. B. Christianson	Franz M. Misch	V. E. Engman	L. R. Morgan
	F. R. Spofford	W. D. Gibson	G. W. Benson	J. A. Jorlett

	1950-1951	1951-1952	1952-1953	1953-1954
President	W. A. Huckstep	Guy E. Martin	F. R. Spofford	Lee Mayfield
1st V.-Pres.	Guy E. Martin	F. R. Spofford	Lee Mayfield	H. M. Harlow
2nd V.-Pres.	F. R. Spofford	Lee Mayfield	H. M. Harlow	J. A. Jorlett
3rd V.-Pres.	Lee Mayfield	H. M. Harlow	J. A. Jorlett	R. R. Gunderson
4th V.-Pres.	H. M. Harlow	J. A. Jorlett	R. R. Gunderson	W. H. Huffman
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	F. M. Misch	M. H. Dick	W. H. Huffman	M. H. Dick
	L. R. Morgan	R. R. Gunderson	L. R. Morgan	J. F. Warrenfells
	J. A. Jorlett	J. F. Warrenfells	B. M. Stephens	G. Switzer
	M. H. Dick	W. H. Huffman	M. H. Dick	B. M. Stephens
	R. R. Gunderson	L. R. Morgan	J. F. Warrenfells	W. H. Bunge
	J. F. Warrenfells	B. M. Stephens	G. Switzer	E. R. Schlaf

	1954-1955	1955-1956	1956-1957	1957-1958
President	H. M. Harlow	J. A. Jorlett	R. R. Gunderson	W. H. Huffman
1st V.-Pres.	J. A. Jorlett	R. R. Gunderson	W. H. Huffman	M. H. Dick
2nd V.-Pres.	R. R. Gunderson	W. H. Huffman	M. H. Dick	B. M. Stephens
3rd V.-Pres.	W. H. Huffman	M. H. Dick	B. M. Stephens	H. D. Curie
4th V.-Pres.	M. H. Dick	B. M. Stephens	H. D. Curie	
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	B. M. Stephens	J. F. Warrenfells	W. H. Bunge	G. W. Benson
	W. H. Bunge	H. D. Curie	E. R. Schlaf	J. M. Lowry
	E. R. Schlaf	J. M. Lowry	G. W. Benson	H. A. Matthews
	J. F. Warrenfells	W. H. Bunge	J. M. Lowry	T. M. von Sprecken
	H. D. Curie	E. R. Schlaf	T. M. von Sprecken	W. H. Bunge
	J. M. Lowry	G. W. Benson	H. A. Matthews	E. R. Schlaf

	1958-1959	1959-1960
President	M. H. Dick	B. M. Stephens
1st V.-Pres.	B. M. Stephens	H. D. Curie
2nd V.-Pres.	H. D. Curie	G. W. Benson
3rd V.-Pres.	G. W. Benson	J. M. Lowry
Secretary	Ruth Weggeberg	Ruth Weggeberg
Treasurer	L. C. Winkelhaus	L. C. Winkelhaus
Directors	J. M. Lowry	W. H. Bunge
	R. C. Baker	E. R. Schlaf
	W. H. Bunge	H. A. Matthews
	E. R. Schlaf	M. J. Hubbard
	H. A. Matthews	R. C. Baker
	M. J. Hubbard	R. H. Miller

LIST OF ANNUAL CONVENTIONS

No.	Place of Meeting	Date	Membership
1	St. Louis, Mo.	Sept. 25, 1891	60
2	Cincinnati, Ohio	Oct. 18-19, 1892	112
3	Philadelphia, Pa.	Oct. 17-19, 1893	128
4	Kansas City, Mo.	Oct. 16-18, 1894	115
5	New Orleans, La.	Oct. 15-16, 1895	122
6	Chicago, Ill.	Oct. 20-22, 1896	140
7	Denver, Colo.	Oct. 19-21, 1897	127
8	Richmond, Va.	Oct. 18-19, 1898	148
9	Detroit, Mich.	Oct. 17-19, 1899	148
10	St. Louis, Mo.	Oct. 16-18, 1900	143
11	Atlanta, Ga.	Oct. 15-17, 1901	171
12	Minneapolis, Minn.	Oct. 21-23, 1902	195
13	Quebec, Canada	Oct. 20-22, 1903	223
14	Chicago, Ill.	Oct. 18-20, 1904	293
15	Pittsburgh, Pa.	Oct. 17-19, 1905	313
16	Boston, Mass.	Oct. 16-18, 1906	340
17	Milwaukee, Wis.	Oct. 15-17, 1907	341
18	Washington, D. C.	Oct. 20-22, 1908	368
19	Jacksonville, Fla.	Oct. 19-21, 1909	393
20	Denver, Colo.	Oct. 18-20, 1910	428
21	St. Louis, Mo.	Oct. 17-19, 1911	499
22	Baltimore, Md.	Oct. 15-17, 1912	524
23	Montreal, Quebec	Oct. 21-23, 1913	570
24	Los Angeles, Cal.	Oct. 20-22, 1914	586
25	Detroit, Mich.	Oct. 19-21, 1915	665
26	New Orleans, La.	Oct. 17-19, 1916	710
27	Chicago, Ill.	Oct. 16-18, 1917	704
28	Chicago, Ill.	Oct. 15-17, 1918	716
29	Cleveland, Ohio	Oct. 21-23, 1919	776
30	Atlanta, Ga.	Oct. 26-28, 1920	840
31	New York, N.Y.	Oct. 18-20, 1921	850
32	Cincinnati, Ohio	Oct. 17-19, 1922	865
33	Seattle, Wash.	Oct. 16-18, 1923	846
34	Kansas City, Mo.	Oct. 21-23, 1924	837
35	Buffalo, N.Y.	Oct. 20-22, 1925	759
36	Richmond, Va.	Oct. 12-14, 1926	750
37	Minneapolis, Minn.	Oct. 18-20, 1927	754
38	Boston, Mass.	Oct. 23-25, 1928	755
39	New Orleans, La.	Oct. 15-17, 1929	755
40	Louisville, Ky.	Oct. 21-23, 1930	713
41	Chicago, Ill.	Oct. 16-18, 1934	592
42	Chicago, Ill.	Oct. 15-17, 1935	547
43	Chicago, Ill.	Oct. 20-22, 1936	588
44	Chicago, Ill.	Oct. 19-21, 1937	566
45	Chicago, Ill.	Oct. 18-20, 1938	589
46	Chicago, Ill.	Oct. 17-19, 1939	546
47	Chicago, Ill.	Oct. 15-17, 1940	610
48	Chicago, Ill.	Oct. 14-16, 1941	594
49	Chicago, Ill.	Oct. 20-22, 1942	618
50	Chicago, Ill.	Oct. 20-21, 1943	597
51	Chicago, Ill.	Sept. 17-19, 1946	698
52	Chicago, Ill.	Sept. 16-18, 1947	651
53	Chicago, Ill.	Sept. 20-22, 1948	652
54	Chicago, Ill.	Sept. 12-14, 1949	676
55	Chicago, Ill.	Sept. 18-20, 1950	713
56	Chicago, Ill.	Sept. 17-19, 1951	676
57	Chicago, Ill.	Sept. 15-17, 1952	667
58	Chicago, Ill.	Sept. 15-17, 1953	666
59	Chicago, Ill.	Sept. 13-15, 1954	682
60	Chicago, Ill.	Sept. 19-21, 1955	625
61	Chicago, Ill.	Sept. 18-20, 1956	657
62	Chicago, Ill.	Sept. 23-25, 1957	769
63	Chicago, Ill.	Sept. 15-17, 1958	828
64	Chicago, Ill.	Sept. 15-17, 1959	863
65	Chicago, Ill.	Sept. 19-21, 1960	932

ASSOCIATION OF TRACK AND STRUCTURE SUPPLIERS

Achuff Railway Supply Co.
Aeroquip Corporation
Air Reduction Sales Co.
Airstream Trailers, Inc.
Aldon Company, The
Allied Chemical Corp.
Allis Chalmers Mfg. Co.
Amchem Products, Inc.
American Brake Shoe Co.
American Concrete Crosstie Corp.
American Hoist & Derrick Co.
American R.R. Curvelining Corp.
Armco Drainage & Metal Products Co.
Athey Products Corp.
Austin-Western Const. Equip. Div.
Baldwin-Lima-Hamilton Corp.

Bernuth, Lembcke Co., Inc.
Binks Manufacturing Co.
Bird & Son, Inc.
R. H. Bogle Co.
Briggs & Stratton Corp.
Buckeye Iron & Brass Works

Carter-Waters Corp.
Caterpillar Tractor Co.
Chicago Pneumatic Tool Co.
Chipman Chemical Co., Inc.
Cleveland Frog & Crossing Co.
Clinton Engines Corp.
Colorado Fuel & Iron Corp.
Conley Frog & Switch Co.
Continental Motors Corp.
W. T. Cox Co., Inc.
Cullen-Friestedt Co.

Daubert Chemical Co.
Dearborn Chemical Co.
Dow Chemical Co., The
E. I. du Pont de Nemours & Co., Inc.
Duff-Norton Co., The

Eaton Manufacturing Co. — Reliance Div.
Elliott Manufacturing Co.
Enterprise Railway Equipment Co.

Fabreeka Products Co.
Fairmont Railway Motors, Inc.
Foundation Equipment Corp.

Gandy Wagon Co.
Geigy Agricultural Chemicals
Goodyear Tire & Rubber Co.
Gorman-Rupp Co., The
Gray Company, Inc.
Greenville Steel Car Co.

Brice Hayes Co., The
Hayes Track Appliance Co.
Robert W. Hunt Co.

Industrial Brownhoist Corp.
Ingersoll Rand Co.
International Harvester Co.
Const. Equip. Div.

Jackson Vibrators, Inc.
Johnson Rubber Co.
O. F. Jordan Co.

Kalamazoo Manufacturing Co.
Kasle Steel Corp.
Kershaw Manufacturing Co.
Koehring Div. of Koehring Co.
Kohler Co.
Koppers Co., Inc., Wood Pres. Div.

LFM Mfg. Co., Inc., The
Lehon Company
LeRoi Div. — Westinghouse Air Brake Co.
Linde Co. — Div. Union Carbide Corp.
Link-Belt Speeder Corp.

Mahon, R. C. Co.
Maintenance Equipment Co.
Mannix International, Inc.
Matisa Equipment Corp.
McKiernan-Terry Corp.
Mid-West Forging & Mfg. Co.
Minnesota Mining & Mfg. Co.
Missco Transportation, Inc.
Modern Railroads
Modern Supply Co.
Moore & Steele Corp.
Morrison-International Corp.
Morrison Railway Supply Corp.
T. J. Moss Tie Co.
Motorola Communications & Electronics, Inc.
Murdock Manufacturing & Supply Co.

National Aluminate Co.
National Cylinder Gas-Div. of
Chemetron Corp.
National Lock Washer Co., The
National Torch Tip Co.
Nolan Co., The
Nordberg Manufacturing Co.
Northwestern Motor Co.

D. W. Onan & Sons, Inc.

P & M Co., The
Permacrete Products Corp.
Permali, Inc.
Pettibone Mulliken Corp.
Philadelphia Steel & Wire Corp.
Pitman Mfg. Co.
Plasser Railway Machinery
Pocket List of Railroad Officials, The
Pullman-Standard Manufacturing Co.
Racine Hydraulics & Machinery, Inc.
Rail Joint Co., The
Rail Service Corp.
Railroad Rubber Products, Inc.
Rails Company, The
Railway Ballast Conditioning Corp.
Railway Maintenance Corp.
Railway Track-work Co.
Reade Manufacturing Co., Inc.
Remington Arms Co., Inc.
Ridge Tool Co., The

Schield-Bantam Co.
Schramm, Inc.
Simmons-Boardman Publishing Corp.
Southern Amiesite Asphalt Co.
Frank Speno Ballast Cleaning Co., Inc.
Sperry Rail Service
Spray Products Corp.
Superior Combustion Industries, Inc.

Tamper Limited
Teleweld, Inc.
Templeton, Kenly & Co.
Texaco, Inc.
Thermex Metallurgical, Inc.
Track Specialties Co., Inc.
True Temper Corp.

Union Switch & Signal Div.
Westinghouse Air Brake Co.
Unit Rail Anchor Corp.
U. S. Borax & Chemical Corp.

Vulcan Materials Co.

Warner & Swasey Co.
Wasco Supply Co.
Wellman Engineering Co., The
Western Railroad Supply Co.
White Manufacturing Co.
Wisconsin Motor Corp.
Woodings-Verona-Tool Works
Woolery Machine Co.
Youngstown Sheet & Tube Co., The

CONSTITUTION

ARTICLE I.

NAME

Section 1. This association shall be known as the American Railway Bridge & Building Association.

ARTICLE II.

OBJECT

Section 1.** The object of this association shall be the advancement of knowledge pertaining to the design, construction and maintenance of railway bridges, buildings, water service facilities, and other structures, by investigation, reports and discussions.

Section 2. The association shall neither indorse nor recommend any particular devices, trade marks or materials, nor will it be responsible for any opinions expressed in papers, reports or discussions unless the same have received the endorsement of the association in regular session.

ARTICLE III.

MEMBERSHIP

Section 1. The membership of this association shall be divided into five classes, viz: Members, life members, associate, honorary and junior members.*

Section 2.** A member shall be a person in a position above rank of gang foreman in connection with roadway bridge, building and water service work, or in the employ of a public regulatory body, a professor of engineering in a college, an engineering editor, or a government or private timber expert. Any person desirous of becoming a member shall make application upon the form prescribed by the executive committee, setting forth his name, age, residence and practical experience. He shall furnish at least three references to whom he is personally known. Applicants may be voted into membership at any regular executive meeting or by letter ballot of the executive committee, a majority vote being necessary in either instance.

Section 3.** To be eligible for a life membership a member must have belonged to the association for at least 15†† years and in general must have retired from active railway service due to age or physical disability. He shall have all the privileges of active membership, except the holding of office, and shall not be required to pay annual dues. The transfer from membership to life membership shall be made in the same manner as the election of members, as prescribed in Section 2, of this Article.

Section 4. Associates shall be responsible persons who are not eligible as members, whose pursuits or attainments qualify them to co-operate with members in the study and development of improved practices in the construction and maintenance of bridges, buildings and water facilities. They shall have all the rights of members except of voting and holding office. They shall be elected in the manner prescribed for members, in Section 2, of this Article.

Section 5. Honorary members shall be chosen from persons who have attained acknowledged eminence in some branch of engineering or railway service. Their number shall be limited to ten. Honorary members shall be proposed by not less than six active members and shall be elected by the unanimous vote of the members

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*Amended October 16, 1941.
**Amended September 20, 1948.
††Amended March 10, 1958.

present at a regular meeting. They shall have all the rights of active members except that of holding office and shall be exempt from the payment of dues.

Section 6. A junior member shall be a person who is a graduate of a recognized engineering school, or who has been employed for at least two years in the design, maintenance or construction of railway bridges, buildings or structures. Applicants shall be at least 21 years of age and they shall be elected in the manner prescribed for members, in Section 2 of this article. Juniors shall have all the rights of members except that of holding office. When the attainments of a Junior are such as to qualify him as a member, he may apply for promotion and the Executive Committee shall authorize such promotion when qualifications warrant the action. Unless a Junior is promoted, his membership shall cease automatically when he becomes 28 years of age.*

Section 7. Any member guilty of conduct unbecoming to a railroad officer and a member of this association, or who shall refuse to comply with the rules of this association, shall forfeit his membership on a two-thirds vote of the executive committee.

Section 8. Membership shall continue until written resignation is received by the secretary, unless member has been previously expelled, or dropped for non-payment of dues in accordance with Section 1 of Article VII.

Section 9.** Only active members shall hold office in this association, and only active and life members shall be entitled to vote in the election of officers.

ARTICLE IV.

OFFICERS

Section 1†. The officers of this association shall be a president, three vice-presidents, a secretary, a treasurer and six directors who with the most recent past president shall constitute the executive committee.

Section 2. The past presidents of this association, previous to the most recent past president, who continue to be members, shall be privileged to attend all meetings of the executive committee, of which meetings they shall receive due notice, and be permitted to discuss all questions and to aid said committee by their advice and counsel; but said past presidents shall not have a right to vote, unless called upon to fill a quorum.

Section 3. Vacancies in any office shall be filled for the unexpired term by the executive committee without delay.

ARTICLE V.

EXECUTIVE COMMITTEE

Section 1.** The executive committee shall manage the affairs of the association and shall have full power to control and regulate all matters not otherwise provided for in the constitution and by-laws and shall exercise general supervision over the financial interests of the association, and make all necessary purchases and contracts required to conduct the general business of the association, but shall not have the power to render the association liable for any debt beyond the amount then in the treasury plus accounts receivable and not subject to other prior liabilities. All appropriations for special purposes must be acted upon at a regular meeting of the association.

Section 2. Meetings of the executive committee may be called by a majority of the members of the committee, providing 10 days' notice is given members by mail.

Section 3. Five members of the executive committee shall constitute a quorum for the transaction of business.

ARTICLE VI.

ELECTION OF OFFICERS AND TENURE OF OFFICE

Section 1. Except as otherwise provided, the officers shall be elected at the regular annual meeting of the association and the election shall not be postponed except by unanimous consent of the members present at said annual meeting. The

*Amended October 16, 1941.
**Amended September 20, 1948.
†Amended September 21, 1957.

election shall be by ballot, a majority of the votes cast being required for election. Any active member of the association not in arrears for dues shall be eligible for office, but the president shall not be eligible for reëlection.

Section 2‡. The president, three vice-presidents, secretary and treasurer shall hold office for one year and the directors for three years, two directors being elected each year. All officers retain their office until their successors are elected and installed. A director elected for a three-year term shall not be eligible to serve two consecutive terms.

Section 3.† The term of office of the secretary and the treasurer may be terminated at any time by a two-thirds vote of the executive committee. Their compensation shall be fixed by a majority vote of the executive committee.

The secretary shall also serve as secretary of the executive committee.

Section 4. The secretary and the treasurer shall be required to give bond in an amount to be fixed by the executive committee.

ARTICLE VII.

MEMBERSHIP FEE AND DUES

Section 1.† Every member upon joining this association shall pay to the secretary an entrance fee and dues as prescribed by the executive committee. No member in arrears for annual dues shall be entitled to vote at any election and any member more than one year in arrears may be stricken from the list of members at the discretion of the executive committee.

Section 2.‡ A person stricken from the list of members because of non-payment of dues, upon written application may be reinstated as a member in his former class without loss of privileges, either upon payment of all back dues (which must accompany application) or at the discretion of the Executive Committee voting in the manner prescribed in Section 2, Article III.

ARTICLE VIII.*

LOCAL SECTIONS

Section 1.** Upon the application of ten or more members of the association residing in the same geographical district, or having offices therein, the executive committee shall organize a local section for that district, to which all members in that district shall be eligible. Such local section shall admit to active membership only members in good standing. It shall hold not less than two meetings each year, and shall be governed by such constitution and by-laws not inconsistent with the constitution of this association as the section membership may adopt and the executive committee of the association approve.

Section 2. The parent association shall not be put under any obligation, either financial or in the matter of policy or opinion, by any local section.

ARTICLE IX.

AMENDMENTS

Section 1. This constitution may be amended at any regular meeting by a two-thirds vote of the members present, provided that notice of the proposed amendment or amendments has been sent to the members at least 30 days previous to said regular meeting.

BY-LAWS

TIME OF MEETING

1.** The regular meeting of this association shall convene annually during the month of September, the exact date to be fixed by the Executive Committee.

PLACE OF MEETING

2.** The place of holding the annual convention shall be Chicago, Ill.

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†Amended October 17, 1940.
*Article adopted 1922.
**Amended September 20, 1948.
‡Amended September 21, 1957.

3. It shall lie within the power of the executive committee to change the location or time of the meeting if it becomes apparent that it is for the best interests of the association.

QUORUM

4. At the regular meeting of the association, 15 or more members shall constitute a quorum.

**DUES

5. The annual dues, for the fiscal year ending August 31, and payable in advance, shall be as follows:*

Members, $5.00; Associate Members, $4.00; Junior Members, $2.50.

DUTIES OF OFFICERS

6.† The president shall have general supervision over the affairs of the association. He shall preside at all meetings of the association and of the executive committee; shall appoint all committees not otherwise provided for, and shall be ex-officio member of all committees. He shall with the secretary sign all contracts or other written obligations of the association which have been approved by the executive committee. He shall render a detailed report at least three times during the year to the members of the executive committee, showing the financial condition of the association and its activities.

At the annual meeting the president shall present a report containing a statement of the general conditions of the association.

7. The vice-presidents in order of seniority shall preside at meetings in the absence of the president and discharge his duties in case of a vacancy in his office.

8.† It shall be the duty of the secretary to keep a correct record of the proceedings of all meetings of this association, and of all accounts, between this association and its members; to collect all moneys due the association, and deposit the same in the name of the association. He shall pay all bills when properly certified and approved by the president and the treasurer, and make such reports as may be called for by the executive committee. He shall also perform such other duties as the association may require.

9.‡ The treasurer shall have charge of the funds, check all deposits as made by the secretary, sign all checks after they have been approved by the president, and invest all funds not needed for current expenses as directed by the executive committee. He shall report at each annual meeting on the condition of the finances.

NOMINATING COMMITTEE

10.# After each annual meeting the president shall appoint a committee consisting of five members. Two Past Presidents shall be members of this committee, one of whom shall act as Chairman. No other officers of the Association shall be appointed to this committee. This committee shall prepare a list of names of nominees for officers to be voted on at the next annual convention in accordance with ARTICLE VI of the Constitution, said list to be read at the business session of said convention. Nothing in this section shall be construed to prevent any member making further nominations.

AUDITING COMMITTEE

11.‡ Prior to each annual meeting the president shall appoint a committee of three members, not officers of the association, whose duty it shall be to examine the accounts and vouchers of the secretary and the treasurer and certify as to the correctness of their accounts.

COMMITTEE ON SUBJECTS FOR DISCUSSION

12. After each annual meeting the president shall appoint a committee whose duty it shall be to prepare a list of subjects for investigation to be submitted for approval at the next convention.

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†Amended October 17, 1940.
‡Adopted October 17, 1940.
*Amended October 16, 1941.
**Amended September 20, 1948.
#Amended December 4, 1950.

COMMITTEE ON INVESTIGATION

13. After the association has adopted the list of subjects for investigation the president for the succeeding year shall appoint the committees who shall prepare the subjects for report and discussion. He may also appoint individual members to prepare reports on special subjects, or to report on any special or particular subject.

PUBLICATION COMMITTEE

14. After each annual meeting the executive committee shall appoint a publication committee consisting of three active members whose duty it shall be to coöperate with the secretary in the issuing of the publications of the association. The assignment of this committee shall be such that at least one member shall have served on the committee during the previous year.

ORDER OF BUSINESS

15.† Call to order by president.
Opening prayer or invocation.
President's address.
Report of secretary.
Report of treasurer.
Appointment of special committees.
Reports of standing committees and presentation of papers.
Unfinished business.
New business.
Election of officers.
Installation of officers.
Adjournment.

DECISIONS

16. The votes of a majority of the members present shall decide any questions, motion or resolution which shall be brought before the association, unless otherwise provided. Unless specifically provided herein otherwise, all discussions shall be governed by Robert's rules of order.

AMENDMENTS

17.† The By-Laws can be amended by a two-thirds vote of those present at any regularly called Executive Committee Meeting.

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†Amended September 20, 1948.

DIRECTORY OF MEMBERS

as of March 1, 1961

(Figure after each name indicates year when member joined the association)

* Indicates Junior Member

HONORARY MEMBERS

Barnhart, E. H., (Ret.), Div. Engr., B. & O., St. Petersburg, Fla. (1941)
Bechtelheimer, A. E., (Ret.) Br. Engr., C. & N. W., Chicago, Ill. (1920)
Budd, Ralph, (Ret.) Pres., C. B. & Q., Santa Barbara, Calif. (1927)
Crites, G. S., (Ret.) Div. Engr., B. & O., Baltimore, Md. (1912)
Howard, N. D., Exec. Secy., A. R. E. A., Chicago, Ill. (1926)
Strate, T. H., (Ret.) Div. Engr., C. M. St. P. & P., San Ysidro, Calif. (1918)
Vandenburgh, E. C., (Ret.) Ch. Engr., C. & N. W., Chicago, Ill. (1925)

ACTIVE MEMBERS

A

Albert, E. A., Br. Insp., I. C., Chicago, Ill. (1956)
Allen, W. V., Asst. Supv. B. & B., C. & O., Huntington, W. Va. (1959)
Alley, F. T., Asst. B. & B. Supv., St. L. S. W., Tyler, Tex. (1955)
Anderson, A. C., Gen. B. & B. Fore., D. M. & I. R., Two Harbors, Minn. (1952)
Anderson, M. P., Ch. Engr., Monon, Lafayette, Ind. (1959)
Armstrong, W. F., Engr. Bldgs., C. & N. W., Chicago, Ill. (1947)
Atkins, A. I., Bldg. Struc. Engr., B. & O., Baltimore, Md. (1959)

B

Babbitt, J. H., Div. Engr., B. & O., Indianapolis, Ind. (1946)
Babcock, D. L., Supv. B. & B., C. & N. W., Milwaukee, Wis. (1953)
Baker, F. A., Asst. Gen. Br. Insp., S. P., San Francisco, Calif. (1955)
Baker, G. A., Trstmn., G. C. & S. F., Ft. Worth, Tex. (1958)
Baker, R. C., Engr. Struc., C. & E. I., Danville, Ill. (1940)
Bangs, E. L., Gen. Br. Insp., C. & N. W., Chicago, Ill. (1957)
Barhan, L. M., Tr. Mast.-Rdm., N. P., Mandan, N. D. (1956)
Barke, W. B., Asst. Supv. B. & B., G. N., Wenatchee, Wash. (1958)
Barnes, J. A., Asst. Engr. Trk., C. & N. W., Chicago, Ill. (1957)
Barr, H. L., Div. Engr., C. & N. W., Boone, Iowa (1938)
Barranco, S. J., Supv. Struc., P. R. R., Cincinnati, Ohio (1951)
Barsema, M., Asst. B. & B. Supv., C. & N. W., Chicago, Ill. (1958)
Bartlett, E. W., Detailer, C. M. St. P. & P., Chicago, Ill. (1959)
Bassinger, F. O., Engr. P. & H., N. Y. N H. & H., New Haven, Conn. (1959)
Bateman, E. F., B. & B. Supv., U. P., Salt Lake City, Utah (1958)
Beam, Y. C., Mast. Carp., S. A. L., Americus, Ga. (1945)
Beatty, A. G., Supv. Scl. & Wk. Equip., C. & N. W., Chicago, Ill. (1957)
Beaver, J. F., Asst. Ch. Engr., Sou., Washington, D. C. (1950)
Becker, A. L., Eng. Struc., M. P., St. Louis, Mo. (1957)
Beckert, R. C., Drafts., P. R. R., Chicago, Ill. (1959)
Beeder, R. H., Ch. Engr.-Sys., A. T. & S. F., Chicago, Ill. (1958)
Bell, D. V., Mast. Carp., B. & O., Dayton, Ohio (1957)
Benson, G. W., Div. Engr., C. of G., Macon, Ga. (1940)
Benson, O. C., Asst. Engr. M. of W., B. & M., Boston, Mass. (1952)
Beringer, M. A., Supt. Br. Erec., I. C., Chicago, Ill. (1929)

Bertel, D. J., Div. Engr., M. P., DeQuincy, La. (1957)
Best, R. A., Engr.-Insp., U. P., Kansas City, Mo. (1958)
Billings, C. N., Asst. Ch. Engr., T. & N. O., Houston, Tex. (1959)
Billingsley, C. C., Asst. Mast. Carp., S. A. L., Raleigh, N. C. (1959)
Billmeyer, E. D., Br. & Struc. Engr., W. M., Baltimore, Md. (1955)
Bird, H. F., Dist. Engr. Struc., N. Y. C., Syracuse, N. Y. (1959)
Bisbee, R. D., Div. Engr., P. & S. F., Slaton, Tex. (1947)
Bishop, I. A., Mast. Carp., S. A. L., Raleigh, N. C. (1955)
Black, A. R., Spec. Rep., T. & N. O., Houston, Tex. (1953)
Blackmore, J., Sr. Asst. B. & B. Supv., S. P., San Jose, Calif. (1960)
Blake, B. D., Res. Engr., C. R. I. & P., El Reno, Okla. (1959)
Blake, J. E., Jr., Supv. Struc., P. R. R., Williamsport, Pa. (1953)
Bleul, G. J., Asst. Engr. Bldgs., B. &. O., Baltimore, Md. (1959)
Block, M., Asst. to Ch. Engr., I. C., Chicago, Ill. (1948)
Bober, H., B. & B. Engr., G. M. & O., Mobile, Ala. (1947)
Bodie, B. V., Vice Pres. & Gen. Mgr., G. M. & O., Mobile, Ala. (1951)
Boehling, H. A., Jr., Asst. Supv. Br. Erect.-Sys., C. & O., Huntington, W. Va. (1948)
Bogle, W. H., Engr. M. of W., P. T. R. A., Houston, Tex. (1959)
Boling, E. C., Supv. B. & B., N. S., Raleigh, N. C. (1950)
Bolling, J. P., Div. Engr., L. & N., Latonia, Ky. (1959)
Bolte, W. R., Motor Car Shop Fore., K. C. S., Pittsburg, Kans. (1959)
Bonnevier, C. J., Engr. Bldg., C. B. & Q., Chicago, Ill. (1957)
Booth, H. E., B. & B. Mast., C. N., Regina, Sask., Can. (1957)
Born, J. O., Prin. Asst. Engr., M. C., Portland, Me. (1956)
Bost, M. R., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1959)
*Bowen, R. L., Rdmn., D. & H., Albany, N. Y. (1957)
Bowman, H. A., Mast. Carp., F. W. & D., Wichita Falls, Tex. (1953)
Bowman, J. R., Supt. B. & B., T. R. R. A. of St. L., St. Louis, Mo. (1958)
Bowman, R. M., Gen. Fore. B. & B., P. R. R., Pittsburgh, Pa. (1954)
Bradfield, R. G., Engr., P. R. R., Chicago, Ill. (1957)
Brandimarte, J. J., Jr., Supv. Struc., P. R. R., Pittsburgh, Pa. (1947)
Bredfeldt, C., Ch. Drafts., C. M. St. P. & P., Chicago, Ill. (1955)
Brenton, G. W., Gen. Supv. B. & B., D. & R. G. W., Denver, Colo. (1957)
Brouse, R. G., Sr., Mast. Carp., C. B. & Q., Chicago, Ill. (1951)
Brown, E. J., Ch. Engr., C. B. & Q., Chicago, Ill. (1955)
Brown, G. A., Gen. Fore. B. & B., A. T. & S. F., Wellington, Kans. (1960)
Brown, G. W., Supv. Auto. & Wk. Equip., T. & N. O., Houston, Tex. (1955)
Brown, K. R., B. & B. Supv., C. & E. I., Salem, Ill. (1956)
Brown, L. W., B. & B. Supv., C. & O., Peru, Ind. (1951)
Brown, W. S., Engr. B. & B. Maint., B. & O., Baltimore, Md. (1959)
Bruns, M. W., Br. Engr., T. R. R. A. of St. L., St. Louis, Mo. (1954)
Buckmaster, W. A., Asst. Div. Engr., B. & O. C. T., Chicago, Ill. (1951)
Bunch, A. H., Gen. Fore. B. & B.-W. S., St. L.-S. F., Ft. Smith, Ark. (1951)
Burch, E. E., Br. Engr., C. M. St. P. & P., Chicago, Ill. (1945)
Burford, A. E., Supv. B. & B., I. C., Memphis, Tenn. (1947)
Burkel, J. N., Drafts., M. P., St. Louis, Mo. (1951)
Burner, P. D., Asst. Gen. Supv. Rdwy., Wk. Equip., W. P., Oakland, Calif. (1953)
Burpee, C. M., Secy., A. W. P. I., Chicago, Ill. (1930)
Burrows, C. D., Mast. Carp., B. & O., Baltimore, Md. (1946)
Butterfield, S. E., B. & B. Supv., C. G. W., St. Paul, Minn. (1959)

C

Caines, W. W., Supv. B. & B., C. & O., Huntington, W. Va. (1938)
Caldwell, F. O., Asst. Mast. Carp., S. A. L., Jacksonville, Fla. (1959)
Calhoun, F. B., Asst. to Ch. Engr., T. & N. O., Houston, Tex. (1959)
Camelle, E. J., B. & B. Supv., T. & N. O., Lafayette, La. (1954)
Cameron, W. M., Ch. Carp., C. M. St. P. & P., Milwaukee, Wis. (1955)
Campbell, H. G., Jr., Asst. Supv. Struc., P. R. R., Harrisburg, Pa. (1956)
Campbell, J. E., Gen. Supv. M. of W.-S. Weld., W. P., Oakland, Calif. (1954)
Campbell, J. G., Gen. Supt., D. & M., Tawas City, Mich. (1959)
Cannon, B. E., Engr. Struc., Alaska, Anchorage, Alaska (1959)
Cantrell, C. F., Jr., Paint. Fore., I. C., Vicksburg, Miss. (1956)
Carlson, A. W., Engr. Br. & Struc., W. P., San Francisco, Calif. (1955)
Carpenter, G. B., Trav. Br. Insp., E.-L., Lakewood, N. Y. (1959)
Carpenter, R. H., Engr. M. of W., M. P., St. Louis, Mo. (1956)

Carr, R. D., Gen. Fore. B. & B., Jack. Term., Jacksonville, Fla. (1958)
Carter, T. S., Ch. Engr., M. K. T., Dallas, Tex. (1954)
Cary, N. M., Gen. Div. Engr., Sou., Atlanta, Ga. (1953)
Cash, E. E., Supv. Maint., Camas Prairie, Lewiston, Ida. (1953)
Caywood, J. A., Asst. Ch. Engr.-Maint., B. & O., Baltimore, Md. (1959)
Celander, H. W., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1959)
Cerrone, L. A., Asst. Engr., I. C., Chicago, Ill. (1960)
Chaffin, E. S., Supv. B. & B., N. & W., Crewe, Va. (1957)
Chamberlain, H. L., Supv. Struc., P. R. R., Indianapolis, Ind. (1956)
Chamberlain, P. C., Asst. to Engr. Struc., E.-L., Cleveland, Ohio (1941)
Chamraz, G. J., Designer, I. C., Chicago, Ill. (1960)
Chaney, A. B., (Ret.), Engr. M. of W., M. P., Little Rock, Ark. (1947)
Chapman, W. E., Ch. Engr.-Maint., C. of G., Savannah, Ga. (1959)
Charvat, A. W., Engr. Arch., C. R. I. & P., Chicago, Ill. (1959)
Cheney, R. R., Asst. Supv. Br. Maint., C. M. St. P. & P., Bellevue, Ia. (1953)
Christian, J. E., Asst. Supv. B. & B.-W. Sup., (NF&G) C. & O., Rainelle, W. Va. (1959)
Christy, J. E., Asst. Supv. B. & B., C. & O., Peru, Ind. (1960)
Clark, A., Engr. B. & B., B. & O., Baltimore, Md. (1959)
Clark, K. L., Div. Engr., C. M. St. P. & P., Chicago, Ill. (1939)
Clark, W. H., Div. Engr., P. & S. F., Amarillo, Tex. (1959)
Clouette, H. F., Asst. B. & B. Supv., N. W. P., San Rafael, Calif. (1953)
Cobb, G. W., Sr. Asst. B. & B. Supv., S. P., Sparks, Nev. (1960)
Cole, G., Gen. Fore. B. & B., A. T. & S. F., Emporia, Kans. (1949)
Collier, P. B., Supt. of Scl., M. P., St. Louis, Mo. (1938)
Collings, J. E., Ch. Carp., C. M. St. P. & P., Aberdeen, S. D. (1953)
Collins, A. T., Asst. B. & B. Mast., C. N., Port Arthur, Ont., Can. (1959)
Collum, R. L., Mast. Carp., S. A. L., Jacksonville, Fla. (1941)
Conner, L. E., Gen. Supv. Rdwy. Equip., S. A. L., Hamlet, N. C. (1959)
Connor, J. J., Const. Engr., D. & H., Albany, N. Y. (1957)
Cook, E. F., W. S. Fore., M. P., Little Rock, Ark. (1947)
Cook, J. C., Jr., Asst. Gen. Fore. B. & B.-W. S., G. C. & S. F., Ft. Worth, Tex. (1959)
Cooper, S. A., Ch. Engr., G. M. & O., Mobile, Ala. (1959)
Corbett, R. K., Gen. Fore. B. & B.-W. S., A. T. & S. F., San Bernardino, Calif. (1956)
Cothran, R. F., B. & B. Supv., Sou., Knoxville, Tenn. (1957)
Cox, R. C., B. & B. Gen. Supv., W. P., Sacramento, Calif. (1950)
Crane, J. C., Asst. B. & B. Supv., S. P., Portland, Ore. (1957)
Crawford, C. M., Engr.-Insp., U. P., Laramie, Wyo. (1958)
Creek, C. W., Asst. Supv. Struc., P. R. R., Chicago, Ill. (1957)
Creighton, J. H., B. & B. Mast., C. P., Toronto, Ont., Can. (1959)
Crespo, M. J., Gen. Supv. Br. & Struc., W. P., San Francisco, Calif. (1956)
Croft, P. H., Asst. Engr. M. of W., I. C., Memphis, Tenn. (1947)
Crounse, W. E., Const. Insp., D. & H., Albany, N. Y. (1945)
Cruikshank, A. W., B. & B. Supv., D. & H., Colonie, N. Y. (1950)
Curie, H. D., Mast. Carp., B. & O., Garrett, Ind. (1942)
Currier, L. F., Asst. Br. Engr., L. & N., Louisville, Ky. (1958)

D

Dahlberg, A. R., B. & B. Supv., W. M., Hagerstown, Md. (1957)
Dal Cerro, N. J., Elec. Fore., P. R. R., Chicago, Ill. (1957)
Dalziel, H. M., Ch. Engr., South Buff., Bethlehem, Pa. (1959)
David, J. J., Asst. Supv. Auto. & Wk. Equip., T. & N. O., Houston, Tex. (1953)
Davidson, J. W., Engr. Br., C. B. & Q., Chicago, Ill. (1957)
Davis, H. E., Supv. B. & B., N. Y. C., Mattoon, Ill. (1940)
Day, F. D., Area Engr. Struc., P. R. R., Pittsburgh, Pa. (1949)
Deal, C. D., Supv. Wk. Equip. & Weld., N. Y. C., Verplanck, N. Y. (1959)
Defendorf, C. E., Ch. Engr., N. Y. C., New York, N. Y. (1956)
Deno, L. J., Staff Engr., C. & N. W., Chicago, Ill. (1947)
Denz, O. C., Asst. Engr, C. M. St. P. & P., Chicago, Ill. (1960)
Derryberry, J. T., Supv. B. & B., W. M., Cumberland, Md. (1955)
DeValle, J. W., Engr. Br.-Sys., Sou., Washington, D. C. (1959)
DeWine, J. M., Asst. Supv., Sou., Chattanooga, Tenn. (1960)
Dick, M. H., Vice Pres. & Ed., Ry. Trk. & Struc., Chicago, Ill. (1937)
Dickison, C. S., Supv. B. & B., C. & O., Russell, Ky. (1953)
Diehl, C. M., Asst. Engr., W. M., Cumberland, Md. (1959)
Dimick, C. A., Supv. B. & B., N. Y. C., Springfield, Mass. (1957)

Dixon, C. E., Supv. B. & B., M. C., Bangor, Me. (1955)
Dixon, N., B. & B. Mast., C. N., Montreal, Que., Can. (1949)
Doggett, T. S., Supv. B. & B. & Maint. Force, R. F. & P., Richmond, Va. (1959)
Dove, R. E., Assoc. Ed., Ry. Trk. & Struc., Chicago, Ill. (1934)
Duffy, P. E., Supv. B. & B., G. N., Minneapolis, Minn. (1957)
Dunlop, A. R., Jr., Supv. Struc., P. R. R., Cleveland, Ohio (1959)
Dunn, W. M. S., Staff Asst. to Ch. Engr., C. & O., Huntington, W. Va. (1957)
Duresky, F., Jr., Supv. B. & B., C. & N. W., Huron, S. D. (1942)
Durston, S. G., Mast. Carp., E.-L., Salamanca, N. Y. (1959)
Dysart, C. E., Supv. B. & B., F. E. C., St. Augustine, Fla. (1959)
Dysinger, M. A., Asst. Engr., Sou., Washington, D. C. (1956)

E

Eargle, J. M., Mast. Carp., S. A. L., Atlanta, Ga. (1953)
Eble, A. E., Tr. Mast., St. L. S. W., Texarkana, Tex. (1953)
Elledge, L. M., Asst. Gen. Mgr., M. P., Little Rock, Ark. (1959)
Ellerbrock, D. T., Mast. Carp., B. & O., Indianapolis, Ind. (1956)
Elliott, C. E., Engr. Trk., W. P., San Francisco, Calif. (1950)
Ellis, J. S., Supv. B. & B., C. & O., Grand Rapids, Mich. (1957)
Elower, L., Trav. Br. Insp., E.-L., Owego, N. Y. (1948)
Enderle, R. E., Div. Engr., B. & O., Garrett, Ind. (1955)
Enger, E. M., Supv. B. & B., C. & N. W., St. Paul, Minn. (1947)
Engle, T. J., Engr. Bldg., C. R. I. & P., Chicago, Ill. (1959)
Erickson, O., B. & B. Fore., S. P., Sacramento, Calif. (1950)
Erskine, J. A., Asst. B. & B. Engr., G. M. & O., Mobile, Ala. (1959)
Etchison, F. L., Ch. Engr., W. M., Baltimore, Md. (1959)

F

Fairchild, E. H., Asst. Engr., U. P., North Platte, Nebr. (1958)
Fetters, R. B., Div. Engr., C. R. I. & P., El Reno, Okla. (1958)
Firehammer, L. M., Supv. B. & B., Ill. Term., Springfield, Ill. (1919)
Fisher, D. H., Supv. Br. Maint., C. M. St. P. & P., Chicago, Ill. (1952)
Flayhart, W. H., Gen. Fore. B. & B., P. R. R., Williamsport, Pa. (1959)
Fobes, E. E., (Ret.), Supv. B. & B., N. Y. C., Syracuse, N. Y. (1957)
Fondren, R. W., B. & B. Supv., Sou., Greenville, S. C. (1958)
Forbes, I. G., Asst. Engr. Bldgs., I. C., Chicago, Ill. (1960)
Foreman, J. R., Jr., Engr. Struc.-Oper., B. & L. E., Greenville, Pa. (1957)
Forman, H. C., Asst. Vice Pres., L. & N., Birmingham, Ala. (1958)
Forseth, C. E., Div. Engr., W. P., Sacramento, Calif. (1950)
Fort, O. E., Asst. Ch. Engr., St. L.-S. F., Springfield, Mo. (1957)
Foster, C. B., B. & B. Supv., Sou., Greensboro, N. C. (1954)
Fox, J., Supv. M. of W., C. P., Montreal, Que., Can. (1955)
Fox, R. L., Proc. Engr.-Struc., Sou., Washington, D. C. (1935)
Franzen, E. T., Engr. Br., C. R. I. & P., Chicago, Ill. (1957)
Frederick, A. H., Ch. Oper. Detector Cars, C. M. St. P. & P., Chicago, Ill. (1959)
Frederickson, N. H., Supv. W. S., I. C., Memphis, Tenn. (1956)
Freseman, C. J., Div. Engr., C. & N. W., St. Paul, Minn. (1957)
Friets, C. G., Supv. B. & B., C. & N. W., Escanaba, Mich. (1957)
Fritzinger, G. F., Asst. Engr., Wabash, St. Louis, Mo. (1957)
Fronabarger, H. C., (Ret.), B. & B. Supv., T. & P., Ft. Worth, Tex. (1949)
Frost, A. K., Asst. to Ch. Engr., E.-L., Cleveland, Ohio (1961)
Frost, L. M., Supv. B. & B., G. T. W., Battle Creek, Mich. (1938)
Fuller, T. L., Br. Engr., S. P., San Francisco, Calif. (1959)
Fussell, W., Asst. Supv. B. & B., L. & N., Pensacola, Fla. (1959)

G

Gableman, P. D., Asst. Supv. B. & B., G. N., Grand Forks, N. D. (1960)
Gabrio, C. W., Engr. Struc., Virginian, Norfolk, Va. (1947)
Gamble, H. H., Asst. Trk. Supv., B. & M., North Adams, Mass. (1957)
Gallaher, R. T., Asst. Engr., Sou., Atlanta, Ga. (1960)
Gannon, J. P., Div. Engr., M. St. P. & S. S. M., Stevens Point, Wis. (1947)
Garcelon, C. E., Asst. to Mgr. Oper., B. & A., Bangor, Me. (1945)
Garland, E. F., Br. Supv., N. O. P. B., New Orleans, La. (1953)
Gates, C. A., Br. Engr., A. T. & S. F., Topeka, Kans. (1959)
Gehrke, E. G., Asst. Secy., A. R. E. A. & Secy., Engr. Div., A. A. R., Chicago, Ill. (1959)
George, S. W., Div. Engr., W. M., Cumberland, Md. (1956)

Gibson, D. S., Prin. Asst. Engr., St. L. S. W., Pine Bluff, Ark. (1960)
Gilbert, W. J., Asst. Engr., C. G. W., Oelwein, Ia. (1960)
Gillespie, W. G., Mast. Carp., B. & O., Grafton, W. Va. (1946)
Gilmore, J. M., Meth. Engr. B. & B., N. Y. C., New York, N. Y. (1959)
Gilmore, R. W., Gen. Br. Insp., B. & O., Cincinnati, Ohio (1943)
Gipson, C. G., Gen. Fore. B. & B. - W. S., A. T. & S. F., Winslow, Ariz. (1956)
Gladwin, F. E., B. & B. Supv., N. W. P., San Rafael, Calif. (1950)
Goforth, J. A., Maint. Engr., Clinchfield, Erwin, Tenn. (1954)
Gogl, E. U., B. & B. Supv., S. P., Portland, Ore. (1955)
Gottsabend, W. J., Supv. Struc., P. R. R., Cincinnati, Ohio (1957)
Graham, W. R., Supv. B. & B., C. & O., Covington, Ky. (1946)
Grant, A. F., Asst. B. & B. Supv., N. P., Missoula, Mont. (1959)
Green, C. C., Mast. Carp., B. & O., Wheeling, W. Va. (1953)
Gregory, K. E., Asst. Div. Engr., C. R. I. & P., Blue Island, Ill. (1960)
Gresham, H. M., Ch. Engr., T. C. T., Texas City, Tex. (1960)
Grice, R. A., Asst. B. & B. Supv., N. Y. C. & St. L., Frankfort, Ind. (1960)
Grieder, R. E., Asst. to Br. Engr., G. N., St. Paul, Minn. (1958)
Groner, B. H., Drain. Engr., I. C., Chicago, Ill. (1957)
Gueller, H. L., Asst. Supv. B. & B., C. & N. W., Norfolk, Nebr. (1959)
Gunderson, R. R., Engr. M. of W., W. M., Baltimore, Md. (1947)

H

Haase, E. H., B. & B. Supv., S. P., Oakland, Pier #7, Calif. (1954)
Hagenmaier, C. E., Asst. B. & B. Supv., S. P., Los Angeles, Calif. (1950)
Haines, P., B. & B. Supv., C. & O., Saginaw, Mich. (1943)
Hall, J. H., Asst. Div. Engr., Sou., Macon, Ga. (1955)
Halliday, H. C., B. & B. Mast., C. N., Edmonton, Alta., Can. (1959)
Hamilton, W. A., Jr., Br. Engr., G. C. & S. F., Galveston, Tex. (1955)
Hampton, A. A., B. & B. Supv., M. P., De Quincy, La. (1947)
Hansen, A. E., Ch. Carp., C. M. St. P. & P., Savanna, Ill. (1954)
Harding, W. G., Arch., Wabash, St. Louis, Mo. (1957)
Harlow, H. M., Asst. Gen. Supv. B. & B., C. & O., Richmond, Va. (1939)
Harman, C. A., Gen. Fore. B. & B., P. R. R., Baltimore, Md. (1958)
Harris, A. R., Engr. Br., C. & N. W., Chicago, Ill. (1940)
Harris, E. N., Gen. B. & B. Fore., A. T. & S. F., Ft. Madison, Ia. (1960)
Harrison, G. C., Ch. Engr., L. A. Jct., Los Angeles, Calif. (1959)
Harwood, M. S., (Ret.), Asst. B. & B. Supv., S. P., San Mateo, Calif. (1948)
Hawley, I. H., Asst. Engr., C. & I. M., Springfield, Ill. (1957)
Heck, J. E., Supv. B. & B., C. & O., Ashland, Ky. (1938)
Hecker, R. L., Supv. B. & B., C. & O., Plymouth, Mich. (1947)
Hedley, W. J., Ch. Engr., Wabash, St. Louis, Mo. (1950)
Hefte, A., Asst. B. & B. Supv., N. W. P., San Rafael, Calif. (1952)
Heinlen, R. H., Div. Engr., G. C. & S. F., Ft. Worth, Tex. (1957)
Hellickson, D. E., Asst. Supv. B. & B., G. N., Whitefish, Mont. (1960)
Hellweg, R. D., Asst. Reg. Engr., G. M. & O., Bloomington, Ill. (1947)
Helmle, C. E., Asst. to Ch. Engr., T. & N. O., Houston, Tex. (1959)
Hemmer, A. F., Mast. Carp., C. B. & Q., Omaha, Nebr. (1959)
Hemmeter, L. F., Proj. Engr., B. & O., Baltimore, Md. (1959)
Hendrix, W. P., Engr. B. & B., P. R. R., Philadelphia, Pa. (1954)
Herboth, J. B., Gen. Bldg. Insp., I. C., Chicago, Ill. (1959)
Hickok, B. M., Supv. B. & B., N. Y. C., Cleveland, Ohio (1951)
Higgins, L. H., Gen. Fore. B. & B.-W. S., A. T. & S. F., Clovis, N. M. (1958)
Hillman, W. C., Supv. B. & B., Clinchfield, Erwin, Tenn. (1953)
Hiner, J. T., Ch. Engr. M. of W. & Struc., Sou., Cincinnati, Ohio (1950)
Hinkel, E. H., Mast. Carp., Reading, St. Clair, Pa. (1957)
Hinsch, L. C., Asst. Engr., C. M. St. P. & P., Savanna, Ill. (1957)
Hobbs, J. C., Asst. Supv. B. & B., Clinchfield, Erwin, Tenn. (1958)
Hodgkins, E. W., Jr., Assoc. Ed., Ry. Trk. & Struc., Chicago, Ill. (1958)
Hodgson, A. W., Ch. Carp., C. M. St. P. & P., Deer Lodge, Mont. (1955)
Hoffman, E. L., (Ret.), Div. Engr., C. & N. W., Norfolk, Nebr. (1957)
Hoffmann, J. P., Bldg. Insp., I. C., Waterloo, Iowa (1959)
Hogel, E. C., B. & B. Supv., U. P., North Platte, Nebr. (1958)
Holmes, E. J., Mast. Carp., E.-L., Huntington, Ind. (1952)
Holt, C. V., Jr. Engr.-Grade B, St. L.-S. F., Ft. Smith, Ark. (1959)
Hopkins, J. M., Engr. Design, E. J. & E., Joliet, Ill. (1958)
Hopton, J. P., Engr. Maint., C. U. T., Cincinnati, Ohio (1955)

Hornig, F. F., Div. Engr., C. M. St. P. & P., Austin, Minn. (1947)
Hosp, W. B., Paint Supv., N. & W., Roanoke, Va. (1959)
Hostetter, R. A., Gen. Supt. M. of W. Equip. & Scl., T. & N. O., Houston, Tex. (1959)
Howard, J. G., Asst. B. & B. Supv.-Insp., W. P., Sacramento, Calif. (1953)
Howard, P. D., R. R. Supv., Minn. Mining & Mfg., St. Paul, Minn. (1957)
Howe, W. C., Engr. B. & B., B. & L. E., Greenville, Pa. (1959)
Hoyt, A. C., Engr. B. & B., E. J. & E., Joliet, Ill. (1947)
Hoza, W. S., Mast. Carp., E.-L., Hornell, N. Y. (1959)
Hubbard, M. J., Asst. Ch. Engr.-Sys., C. & O., Huntington, W. Va. (1948)
Huckabay, J. B., Asst. Engr., A. T. & S. F., Amarillo, Tex. (1958)
Huckaby, V. T., Asst. Div. Engr., M. K. T., Parsons, Kans. (1947)
Huffman, W. H., Asst. Ch. Engr.-Const., C. & N. W., Chicago, Ill. (1941)
Hull, F. G., Supv. B. & B., C. & O., Blenheim, Ont., Can. (1957)
Humphreys, R. W., Spec. Asst. to Gen. Mgr., N. P., Seattle, Wash. (1947)
Hunt, H. A., Asst. to Ch. Engr., T. & N. O., Houston, Tex. (1959)
Hunter, A. L., Struc. Insp., B. & L. E., Greenville, Pa. (1960)
Huntsman, W. J., Supv. Struc., D. & R. G. W., Grand Junction, Colo. (1957)
Hurley, G. L., Gen. B. & B. Supv., Q. N. S. & L., Sept Isles, Que., Can. (1959)
Hutcheson, F. W., Supv. B. & B., C. & O., Newport News, Va. (1938)
Hutcheson, W. A., Supv. Wk. Equip., C. & O., Clifton Forge, Va. (1939)
Hutchings, V. W., B. & B. Supv., S. P., Bakersfield, Calif. (1941)
Hutchinson, D. G., Asst. B. & B. Supv.-Insp., W. P., Elko, Nev. (1950)
Hutson, H. O., Asst. Engr., B. & O., Baltimore, Md. (1959)
Hutto, J. E., Res. Engr., S. A. L., Savannah, Ga. (1951)
Hyma, W. R., Asst. Engr., A. T. & S. F., Chicago, Ill. (1958)
Hynes, E. J., Asst. B. & B. Engr., D. T. & I., Dearborn, Mich. (1958)

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Inabinet, J. V., Gen. Br. Insp., S. A. L., Jacksonville, Fla. (1948)
Ingram, J. L., Struc. Drafts., T. R. R. A. of St. L., St. Louis, Mo. (1954)

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Jackman, C. E., Ch. Engr.-Const. & Maint., B. & O., Baltimore, Md. (1958)
Jackson, H. O., B. & B. Supv., G. N., Grand Forks, N. D. (1958)
Jackson, S. M., Sp. Engr. Oil & Gas Dev., M. P., St. Louis, Mo. (1951)
Jackson, T. E., Gen. B. & B. Supv., S. P., San Francisco, Calif. (1940)
Jarratt, M., Wtr. & Fuel Supv., S. P., Tucson, Ariz. (1950)
Jarrell, M., Asst. Engr. Br., B. & O., Baltimore, Md. (1959)
Jawor, J. J., Br. Insp., P. R. R., Chicago, Ill. (1959)
Jenkins, H. W., Ch. Engr., N. Y. N. H. & H., New Haven, Conn. (1940)
Jenkins, R. W., Struc. Engr., St. L.-S. F., Springfield, Mo. (1955)
Jentoft, L. H., Asst. Ch. Engr. M. of W., E.-L., Cleveland, Ohio (1959)
Jess, G., Asst. Mast. Carp., E.-L., Youngstown, Ohio (1959)
Johns, D. H., Supv. Struc., P. R. R., Buffalo, N. Y. (1958)
Johnson, A. C., Ch. Engr., E. J. & E., Joliet, Ill. (1944)
Johnson, B. O., Off. Engr., C. M. St. P. & P., Chicago, Ill. (1931)
Johnson, E. A., Engr. Br., I. C., Chicago, Ill. (1953)
Johnson, G. C., B. & B. Supv., C. & N. W., Green Bay, Wis. (1955)
Johnson, H. I., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1957)
Johnson, H. T., Asst. Supv. Struc., P. R. R., New York, N. Y. (1960)
Johnston, G. H., Bldg. Supt., A. T. & S. F., Topeka, Kans. (1950)
Jones, A. C., Jr., Prin. Asst. Div. Engr., S. A. L., Savannah, Ga. (1959)
Jones, E. B., Gen. Fore. Maint. & Const., C. & O., Huntington, W. Va. (1945)
Jorlett, J. A., Area Engr. Struc., P. R. R., Philadelphia, Pa. (1946)

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Kahl, F. B., Asst. Supt. Maint. & Engr., G. N., Klamath Falls, Ore. (1959)
Kampwirth, J. L., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1960)
Kelly, G. E., Wtr. & Fuel Supv., S. P., Bakersfield, Calif. (1953)
Kelly, J. R., B. & B. Supv., Sou., Somerset, Ky. (1952)
Kendall, J. T., Asst. Supv. Struc., P. R. R., Cleveland, Ohio (1949)
Kenyon, J. R., Gen. B. & B. Supv., N. Y., N. H. & H., New Haven. Conn. (1955)
Kick, C. W., Asst. B. & B. Supv., N. P., Seattle, Wash. (1960)
Kieckers, E. W., Asst. Br. Engr., M. P., St. Louis, Mo. (1958)
Kilby, J. T., B. & B. Mast., C. N., Edmundston. N. B.. Can. (1959)
Kirkman, T. C., Civil & Ind. Engr., H. P. T. & D., High Point, N. C. (1961)
Klein, C. A., Br. Maint. Engr., Reading, Philadelphia. Pa. (1958)
Klemphauer, E. C., B. & B. Gen. Fore., K. C. T., Kansas City, Mo. (1960)

Klouda, R. G., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1956)
Knipe, A. E., Draftsman Computor, T. & N. O., Houston, Tex. (1960)
Koehler, P. L., Div. Supt., C. & O., Covington, Ky. (1938)
Koenig, M. E., Div. Engr., C. & N. W., St. Paul, Minn. (1957)
Koster, K., Drafts., C. M. St. P. & P., Chicago, Ill. (1959)
Krefting, A. S., Asst. Ch. Engr.-Br. & Struc., M. St. P. & S. S. M., Minneapolis, Minn. (1935)
Kruse, H. H., Ch. Carp., C. M. St. P. & P., Minneapolis, Minn. (1957)
Kubly, I. J., B. & B. Supv., I. C., Chicago, Ill. (1960)
Kvenberg, S. E., Supv. Bldg. Maint., C. M. St. P. & P., Chicago, Ill. (1932)

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Lackey, J. B., B. & B. Supv., L. & N., Louisville, Ky. (1958)
Langan, G., Asst. Supv. Struc., P. R. R., Indianapolis, Ind. (1957)
Langlois, J. E. R., Asst. B. & B. Mast., C. N. R., Senneterre, Que., Canada (1957)
Langmeyer, A. F., Asst. Gen. Bldg. Insp., I. C., Chicago, Ill. (1960)
*Langston, J. H., Stud. Appren. Engr., St. L.-S. F., Amory, Miss. (1959)
Larson, K., Supv. B. & B., C. & N. W., Boone, Iowa (1957)
Latimer, J. A., Gen. Fore. B. & B. & W. S., St. L.-S. F., Springfield, Mo. (1957)
Laurick, M. J., Supv. Bldgs., P. R. R., New York, N. Y. (1952)
Layman, D. C., Supv. B. & B., I. C., Paducah, Ky. (1952)
Lea, E. T., Ch. Engr. M. of W. & Struc., C. & G., Columbus, Miss. (1959)
Leach, A. L., Asst. Engr. Br., I. C., Chicago, Ill. (1955)
LeDonne, J. A., Engr. Trk., Monon. Conn., Pittsburgh, Pa. (1958)
Lehman, H. G., B. & B. Supv., S. P., Tucson, Ariz. (1950)
Lehman, J. F., Gen. Fore., P. R. R., Chicago, Ill. (1960)
Leinweber, F. J., B. & B. Mast., C. N., St. Thomas, Ont., Can. (1947)
Lewis, A. T., Asst. B. & B. Supv., S. P., Citrus Heights, Calif. (1960)
Lichtenberger, F. W., Mast. Carp., E.-L., Marion, Ohio (1959)
Lieser, H. J., Supv. B. & B., C. & W. I., Chicago, Ill. (1948)
Lingle, T. N., Supv., B. & B., I. C., Carbondale, Ill. (1951)
Linn, G. A., Div. Engr., C. & N. W., Chadron, Nebr. (1940)
Little, H. C., Supv. W. S., I. C., New Orleans, La. (1948)
Littlefield, R. I., Asst. B. & B. Supv., S. P., Oakland, Calif. (1960)
Loggins, L. A., Ch. Engr., T. & N. O., Houston, Tex. (1959)
Lokotzke, G. P., Supv. B. & B., E. J. & E., Gary, Ind. (1947)
Lowry, J. M., Ch. Engr., St. L. S. W., Tyler, Tex. (1950)
Loy, M. L., Jr., Gen. Br. Supv., Sou., Knoxville, Tenn. (1960)
Lucas, H. F., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1952)
Luce, W. L., Mast. Carp., E.-L., Youngstown, Ohio (1952)
Lund, C. V., Asst. to Ch. Engr., C. M. St. P. & P., Chicago, Ill. (1947)
Lundgren, H. M., B. & B. Mast., C. N. R., Prince Albert, Sask., Canada (1957)
Lynch, J. F., Jr., Asst. Div. Engr., S. P., Portland, Ore. (1959)
Lyon, L. E., Div. Engr., S. P., Tucson, Ariz. (1947)

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McCall, H. W., Ch. Carp., C. M. St. P. & P., LaCrosse, Wis. (1955)
McCauley, M. L., Asst. Engr. Struc., N. Y. C., New York, N. Y. (1950)
McCormick, K. L., B. & B. Supv., Pac. Elec., Los Angeles, Calif. (1958)
McCosky, L. E., Supv. B. & B., C. & N. W., Eau Claire, Wis. (1958)
McDermott, A. A., B. & B. Supv., S. P., Dunsmuir, Calif. (1945)
McDermott, B. F., Div. Engr., C. & N. W., Norfolk, Nebr. (1960)
McDiarmid, R. J., Supv. B. & B., E. J. & E., Joliet, Ill. (1957)
McDonald, J. W. (Ret.), Gen. Fore. B. & B. & W. S., St. L.-S. F., Springfield, Mo. (1947)
McElreath, C. S., B. & B. Supv., Sou., Atlanta, Ga. (1951)
McGee, F. E., Ch. Draftsman, P. R. R., Chicago, Ill. (1960)
McGee, M. A., Div. Engr., L. & N., Louisville, Ky. (1954)
McGrew, B. H., Supv. B. & B., St. L. S. W., Tyler, Tex. (1951)
McGrew, F. O., Ch. Carp., C. M. St. P. & P., Madison, Wis. (1948)
McHaffie, J. N., Asst. Supv. B. & B., G. N., Minneapolis, Minn. (1958)
McIver, J., B. & B. Supv., N. S., Edenton, N. C. (1956)
McKenney, C. E., Sys. Scl. Insp., N. Y. C. & St. L., Ft. Wayne, Ind. (1956)
McKibben, D. H., Supv. Struc., P. R. R., Harrisburg, Pa. (1951)
McLaughlin, R. E., Div. Engr., C. M. St. P. & P.-K. C. S. Joint Agcy., Kansas City, Mo. (1960)
McMann, J. B., Gen. B. & B. Fore., U. P., Omaha, Nebr. (1958)
McMaster, R. C., Engr. Asst., B. & L. E., Greenville, Pa. (1960)
McMillan, R. J., B. & B. Mast., C. N., Kamloops, B. C., Can. (1957)

McMillen, J. W., Off. Engr., T. R. R. A. of St. L., St. Louis, Mo. (1954)
McPherson, J. W., Div. Engr., Sou., Greenville, S. C. (1957)

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MacDonald, J. J., Supv. B. & B., B. & M., Boston, Mass. (1959)
Mack, H. L., Asst. Engr., M. P., DeQuincy, La. (1959)
MacQuarrie, A. C., B. & B. Mast., C. N., New Glasgow, N. S., Can. (1957)
Madvig, H. J., Asst. Engr., C. M. St. P. & P., Bensenville, Ill. (1959)
Mahoney, W. J., Jr., Asst. B. & B. Supv., L. & N., Latonia, Ky. (1960)
Malmberg, C. R., Supv. B. & B., C. & N. W., Escanaba, Mich. (1957)
Malone, J. W., Asst. Engr., Wabash, St. Louis, Mo. (1957)
Malone, W. J., Off. Engr., G. T. W., Detroit, Mich. (1959)
Mandia, L., Asst. Supv. Bldgs., P. R. R., New York, N. Y. (1960)
Manson, A., Div. Engr., L. & N., Birmingham, Ala. (1957)
Marriott, L. S., Gen. Bldg. Insp., I. C., Chicago, Ill. (1960)
*Marshall, M., Designer, I. C., Chicago, Ill. (1960)
Martin, J. D., Ch. Carp., C. M. St. P. & P., Canton, S. D. (1955)
Martin, J. W., Mast. Carp., S. A. L., Tampa, Fla. (1953)
Martin, R. T., Asst. Supv. B. & B., F.E.C., Miami, Fla. (1960)
Martin, W. H., Asst. Engr., G. M. & O., Mobile, Ala. (1959)
Martyn, G. W., Off. Engr., E. J. & E., Joliet, Ill. (1959)
Mason, E. L., B. & B. Supv., M. P., Kingsville, Tex. (1946)
Mason, S. K., Ch. Engr., T. M., Laredo, Tex. (1950)
Mathias, H. O., Asst. Engr., P. R. R., Chicago, Ill. (1959)
*Matt, G. L., Jr. Designer, I. C., Chicago, Ill. (1960)
Matthews, H. A., Gen. Fore. B. & B.-W. S., St. L. - S. F., Amory, Miss. (1949)
Matthews, W. L., Sr. Asst. B. & B. Supv., S. P., Tucson, Ariz. (1953)
Mayfield, L., Prin. Asst. Engr., M. P., St. Louis, Mo. (1944)
Mays, J. W. N., Asst. Engr.-Sys., P. R. R., Philadelphia, Pa. (1947)
Meeker, G. W., Gen. B. & B. Fore., N. Y. N. H. & H., Hartford, Conn. (1959)
Meeks, W. R., B. & B. Supv., M. P., Falls City, Nebr. (1942)
Meeth, P. W., B. & B. Insp., St. L.-S. F., Lebanon, Mo. (1957)
Melton, H. W., B. & B. Supv., G. N., Seattle, Wash. (1957)
Meredith, W. E., Supv. Struc., P. R. R., Canton, Ohio (1950)
Merrill, B. W., Supv. B. & B., N. Y. C. & St. L., Conneaut, Ohio (1936)
Meserve, E. S., Asst. Supv. B. & B., B. & M., Dover, N. H. (1949)
Messman, D. V., Engr. Br., Sou., Knoxville, Tenn. (1955)
Mettlach, P. A., B. & B. Fore., G. B. & W., Arcadia, Wis. (1956)
Meyers, B. R., Vice Pres. & Ch. Engr., C. & N. W., Chicago, Ill. (1930)
Midkiff, R. B., Ch. Engr. M. of W. & Struc., Sou., Knoxville, Tenn. (1953)
Miller, R. F., B. & B. Supv., N. Y. C. & St. L., Frankfort, Ind. (1960)
Miller, R. H., Maint. Engr., L. S. & I., Marquette, Mich. (1953)
Milne, A. P., Supv. B. & B., N. Y. C. & St. L., Frankfort, Ind. (1953)
Mitchell, D. N., Asst. Supv. B. & B., C. & O., Newport News, Va. (1948)
Moline, R. F., Br. Engr., D. T. & I., Dearborn, Mich. (1956)
Montague, C. F., Supt. M. W. Equip., P. R. R., Philadelphia, Pa. (1953)
Moore, G. A., Asst. Mast. Carp., S. A. L., Savannah, Ga. (1959)
Moore, H. R., Ch. Engr. M. of W. & Struc., Sou., Charlotte, N. C. (1956)
Moore, I. A., Ch. Engr., C. & E. I., Danville, Ill. (1937)
Moore, J. D., Supv. Struc., P. R. R., Harrington, Del. (1953)
Moreland, H. B., Supv. B. & B., Sou., Hattiesburg, Miss. (1951)
Morgan, C. E., Asst. B. & B. Supv., T. & N. O., San Antonio, Tex. (1954)
Morgan, L. R., Asst. Res. Engr. Struc., A. A. R., Chicago, Ill. (1937)
Moris, R. F., B. & B. Supv., N. Y. C. & St. L., Ft. Wayne, Ind. (1955)
Morris, C. L., Supv. B. & B., L. & N., Mobile, Ala. (1957)
Moser, C. A., B. & B. Supv., W. P. - S. N. - T. W. S., Sacramento, Calif. (1951)
Moser, C. L., B. & B. Supv., Sou., Asheville, N. C. (1955)
Mouhot, P. T., B. & B. Supv., T. & N. O., Lafayette, La. (1952)
Moutoux, H. G., Sr., Supv. B. & B., N. Y. C., Rochester, N. Y. (1959)
Muelder, C. F., Asst. to Engr. Bldgs., C. B. & Q., Chicago, Ill. (1960)
*Murawski, H. J., Draftsman, I. C., Chicago, Ill. (1960)
Murray, D. J., Engr. Drafts., C. & W. I.-Belt Ry. of Chi., Chicago, Ill. (1954)
Myers, E. T., Engr. Editor, Modern R. Rs., Chicago, Ill. (1957)
Myers, R. L., Wtr. Chemist, I. C., Mattoon, Ill. (1950)

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Neal, C. E., Div. Engr., N. W. P., San Rafael, Calif. (1959)
Neal, G. W., Supt., Chattahoochee Valley, West Point, Ga. (1948)

Nelson, M. S., Br. Insp., N. Y. C., Lincoln Park, Mich. (1956)
Nelson, R. D., Div. Engr., C. & N. W., Huron, S. D. (1957)
Newlin, C. H., Engr. Br., Sou., Charlotte, N. C. (1959)
Nicely, O. P., Supv. B. & B., C. & O., Clifton Forge, Va. (1950)
Nichols, J. C., Br. Engr., L. & N., Louisville, Ky. (1954)
Nichols, R. E., Gen. Fore. B. & B.-W. S., St. L.-S. F., Chaffee, Mo. (1957)
Nord, D. L., Designer, I. C., Chicago, Ill. (1961)
Nordstrom, R. D., Asst. Engr. Br. & Struc., W. P., San Francisco, Calif. (1959)

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O'Brien, J. B., Asst. Supv. B. & B., C. & O., Richmond, Va. (1954)
Odgers, F. T., Asst. B. & B. Supv., S. P., Portland, Ore. (1955)
Ogle, H., Br. Insp., C. & E. I., Salem, Ill. (1956)
O'Keefe, F. J., Asst. Supv. Struc., P. R. R., Buffalo, N. Y. (1957)
Olson, O. D., B. & B., Supv., C. & N. W., Chicago, Ill. (1953)
Olson, V. E., B. & B. Supv., M. St. P. & S. S. M., Superior, Wis. (1948)
Ornburn, B. J., Asst. Ch. Engr. Struc., C. M. St. P. & P., Chicago, Ill. (1948)
Orphan, A. J., Asst. Div. Engr., T. & N. O., Houston, Tex. (1960)
Ostrom, W. D., Ch. Carp., C. M. St. P. & P., Chicago, Ill. (1954)
Ovardits, K., Asst. Engr. Grade Cross., N. Y. C., Chicago, Ill. (1953)
Owens, B. H., Gen. Fore. B. & B., I. C., Vicksburg, Miss. (1956)

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Packard, B. G., Off. Engr., C. & N. W., Chicago, Ill. (1954)
Packer, E. B., Jr., B. & B. Supv., Sou., Princeton, Ind. (1960)
Padilla, M. M., Asst. Engr. Const., N. Ry. of M., Mexico, D. F. (1960)
Pagett, C. H., Supt. Struc. & Material, C. of G., Macon, Ga. (1960)
Pahl, W. H., Jr., Supv. Struc., P. R. R., Balitmore, Md. (1950)
Palagi, L. A., Asst. Engr. Bldg., C. R. I. & P., Chicago, Ill. (1959)
Panushka, E. A., B. & B. Supv., N. P., Fargo, N. D. (1959)
Parrish, E. L., Div. Engr., I. C., Vicksburg, Miss. (1947)
Parvin, C. F., Engr. M. of W. & Struc., P. R. R., Philadelphia, Pa. (1959)
Patterson, C. A., B. & B. Supv., T. P. & W., Washington, Ill. (1955)
Patterson, C. C., Mast. Carp., C. B. & Q., Alliance, Nebr. (1958)
Patterson, J. M., Supv. B. & B., N. Y. C., Weehawken, N. J. (1957)
Patterson, R. H., Asst. Ch. Engr., St. L. S. W., Tyler, Tex. (1955)
Payne, G. C., Asst. Div. Engr., St. L.-S. F., Amory, Miss. (1959)
Pearce, J. R., Supv. B. & B., L. & N., Latonia, Ky. (1957)
Pearson, A. H., Mast. Carp., C. B. & Q., St. Joseph, Mo. (1952)
Pederson, W. E., B. & B. Supv., M. St. P. & S. S. M., Superior, Wis. (1950)
Peffly, J. E., (Ret.), Asst. B. & B. Supv., Pac. Elec., Los Angeles, Calif. (1958)
Perrier, J. L., Div. Engr., C. & N. W., Chicago, Ill. (1953)
Peterson, E. A., Rdm., S. D. & A. E., San Diego, Calif. (1960)
Peterson, H. R., Ch. Engr., N. P., St. Paul, Minn. (1953)
Peterson, J. M., Br. Engr., C. G. W., Oelwein, Iowa (1959)
Peterson. N. E., Ch. Engr., C. & I. M., Springfield, Ill. (1938)
Petteys, W. F., Engr. M. of W., E.-L., Jersey City, N. J. (1948)
Pfeiffer, A. B., Asst. B. & B. Supv., S. P., Stockton, Calif. (1939)
Phelps, C. E., B. & B. Supv., A. & W. P. - W. of A., & Ga. R. R., Warrenton, Ga. (1949)
Phillips, J. H., Engr. Struc., D. & H., Albany, N. Y. (1958)
Phillips, L. K., B. & B. Insp., W. M., Cumberland, Md. (1957)
Piper, J. F., Asst. Ch. Engr.-Const., P. R. R., Philadelphia, Pa. (1959)
Potts, G. W., Asst. Supv. B. & B., L. & N., Knoxville, Tenn. (1957)
Potts, H. F., Supv. Struc., P. R. R., Ft. Wayne, Ind. (1957)
Pound, E. R., Mast. Carp., B. & O., Newark, Ohio (1952)
Prentiss, E. W., Engr. B. & B., P. R. R., Philadelphia, Pa. (1959)
Price, A. C., B. & B. Mast., C. P., London, Ont., Can. (1953)
Pritchard, B. L., Gen. Fore. B. & B.-W. S., P. & S. F., Amarillo, Tex. (1956)
Prober, H. W., Sr. Asst. B. & B. Supv., S. P., Los Angeles, Calif. (1957)
Prude, G. F., Asst. Supv. B. & B., T. & N. O., Houston, Tex. (1951)
Pruett, J. A., Supt. Fire Prev. & Fuel Supply, T. & N. O., Houston, Tex. (1959)

R

Raessler, V. D., Supv. B. & B., I. C., Memphis, Tenn. (1951)
Rainey, W. H., B. & B. Supv., T. & N. O., San Antonio, Tex. (1956)
Rainwater, C. W., B. & B. Supv., Alaska, Anchorage, Alaska (1959)
Ranant, F., Asst. Supv. Struc., P. R. R., Newark, N. J. (1955)

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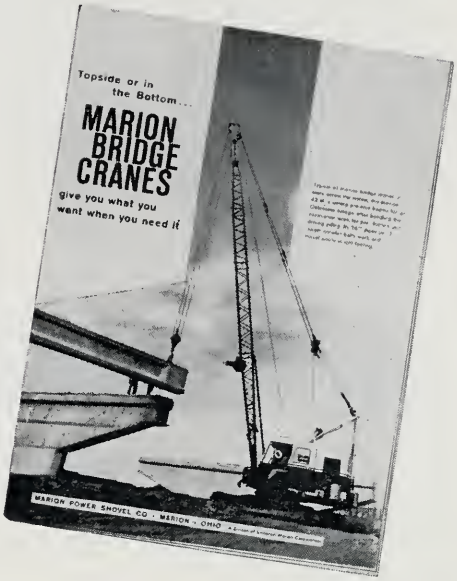

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Reed, T. C., Br. Insp., L. & N., Louisville, Ky. (1954)
Reese, C. L., Br. Insp., G. M. & O., Philadelphia, Miss. (1958)
Reese, C. M., Gen. Fore. B. & B., G. C. & S. F., Temple, Tex. (1953)
Reid, R. H., Asst. Supv. B. & B., C. & O., Clifton Forge, Va. (1955)
Reynolds, M. L., Sr. Asst. B. & B. Supv., S. P., Bakersfield, Calif. (1958)
Rhodes, O. J., Asst. Engr., L. & A.-K. C. S., Shreveport, La. (1958)
Rice, E. D., B. & B. Supv., C. & E. I., Danville, Ill. (1949)
Richardson, F. L., Gen. Fore. B. & B. & W. S., St. L. - S. F., Enid, Okla. (1957)
Ridgeway, J. J., Engr. Struc.-Proc., B. & L. E., Greenville, Pa. (1957)
Riffle, L. R., Ch. Carp., C. M. St. P. & P., Perry, Iowa (1956)
Riggs, W. K., B. & B. Supv., C. & N. W., West Chicago, Ill. (1959)
Riley, C. R., Gen. Mgr., B. & O., Baltimore, Md. (1959)
Roberts, J. T., Div. Engr., Sou., Sheffield, Ala. (1956)
Robey, W. E., Br. Engr. Sys., A. T. & S. F., Chicago, Ill. (1960)
Robinson, G. E., Asst. Ch. Engr., N. Y. C., New York, N. Y. (1948)
Robinson, N. R., B. & B. Fore., S. P., Sacramento, Calif. (1934)
Rode, L. A., Gen. Br. Insp., E.-L., Newark, N. J. (1948)
Rogers, L. W., Designer, I. C., Chicago, Ill. (1960)
Rose, J. A., B. & B. Mast., C. P., Montreal, Que., Can. (1958)
Ross, R. F., Asst. Supv. B. & B., B. & M., Boston, Mass. (1959)
Rothell, R. D., Gen. B. & B. Supv., Sou., Charlotte, N. C. (1957)
Rothwell, G. F., Engr. Plan., Wabash, St. Louis, Mo. (1961)
Rouse, D. I., Gen. Fore. B. & B., P. R. R., Cincinnari, Ohio (1959)
Rowland, J. W., Asst. Engr. Const., L. I., Jamaica, N. Y. (1956)
Rudisill, D. E., Asst. Ch. Engr. Maint., P. R. R., Philadelphia, Pa. (1959)
Runde, E. E., Ch. Masonry Insp., I. C., Chicago, Ill. (1959)
Russell, C. E., Supv. W. S., I. C., Chicago, Ill. (1953)
Rust, R. B., Jr., Asst. Div. Engr., Sou., Bristol, Va. (1957)
Rymer, J. R., Div. Engr., B. & O., Chicago, Ill. (1957)

S

Saether, A. H., Design., C. M. St. P. & P., Chicago, Ill. (1959)
Safley, J. R., B. & B. Supv., S. P., San Francisco, Calif. (1945)
St. Pierre, M. P., Asst. B. & B. Mast., C. N., Edmundston, N. B., Can. (1959)
Salmon, J. M., Jr., Ch. Engr., Clinchfield, Erwin, Tenn. (1938)
Sandberg, C. H., Ch. Engr.-East. Lines, A. T. & S. F., Topeka, Kans. (1958)
Sanders, G. A., Gen. B. & B. Fore., S. P., Los Angeles, Calif. (1960)
Sanderson, J. G., Asst. W. S. Fore., St. L.-S. F., Amory, Miss. (1959)
Sarris, P. T., Div. Engr., Sou., Knoxville, Tenn. (1955)
Sartore, D. V., Asst. Engr. Brdgs., C. B. & Q., Chicago, Ill. (1961)
Sathre, C. O., B. & B. Supv., C. & N. W., Madison, Wis. (1950)
Saunders, T. D., Ch. Engr., Ont. Nor., North Bay, Ont., Can. (1930)
Savage, F. E., Asst. B. & B. Supv., N. P., Minneapolis, Minn. (1957)
Schlaf, E. R., Asst. Supt. W. S., I. C., Chicago, Ill. (1947)
Schmitz, J. F., Br. Insp., M. P., St. Louis, Mo. (1960)
Schoener, J. T., Asst. Engr. Struc., M. P., St. Louis, Mo. (1957)
Schweitzer, E., Div. Engr., U. P., Cheyenne, Wyo. (1959)
Scites, P. E., Asst. Supv. B. & B., C. & O., Hinton, W. Va. (1950)
Seely, W. L., Asst. Engr., D. & H., Albany, N. Y. (1957)
Seitz, H., Struc. Engr., B. & O., Baltimore, Md. (1959)
Seley, L. L., Mast. Carp., C. B. & Q., Hannibal, Mo. (1953)
Sellers, J. B., Asst. Div. Engr., L. & N., Louisville, Ky. (1957)
Seltzer, J. W., Asst. Engr., P. R. R., Cincinnati, Ohio (1958)
Sempsrott, D. A., Dist. Engr., P. R. R., Chicago, Ill. (1959)
Shamblin, R. E., Supv. B. & B., N. & W., Bluefield, W. Va. (1957)
Shanklin, J. F., Asst. Gen. Br. Insp., C. & N. W., Chicago, Ill. (1959)
Sharkey, J. J. (Ret.), Gen. Fore. B. & B., P. R. R., Short Hills, N. J. (1951)
Shaw, J. E., Rdm., T. & N. O., Houston, Tex. (1959)
Short, W. L., Asst. Engr., M. P., St. Louis, Mo. (1951)
Shultz, E. R., Engr. M. of W. & Struc., P. R. R., Philadelphia, Pa. (1959)
Siegfried, F. A., Fore. Carp., Reading, Reading, Pa. (1947)
Simmons, E. R., B. & B. Supv., St. L. S. W., Pine Bluff, Ark. (1955)
Simmons, R. G., Gen. Rdm., C. M. St. P. & P., Chicago, Ill. (1957)
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Sinclair, C. H., Asst. Supv. B. & B., C. & N. W., Milwaukee, Wis. (1954)
Skogreen, J. A., Mast. Carp., C. B. & Q., Wymore, Nebr. (1957)
Sladecek, B. F., Supv. Rdwy. Mach., T. & N. O., Houston, Tex. (1959)
Slagle, G. P., Ch. Carp., C. M. St. P. & P., Milwaukee, Wis. (1948)
Smedley, V. N., B. & B. Supv., U. P., Portland, Ore. (1959)
Smith, A. E., Ch. Engr., C. G. W., Oelwein, Iowa (1958)
Smith, A. P., Engr. B. & B., C. & E. I., Danville, Ill. (1956)
Smith, C. A., Supv. B. & B., C. R. & I. - I. H. B., Hammond, Ind. (1946)
Smith, E. L., Gen. B. & B. Supv., Sou., Chattanooga, Tenn. (1952)
Smith, G. A., Mast. Carp., B. & O., Punxsutawney, Pa. (1959)
Smith, G. H., Struc. Design., M. P., St. Louis, Mo. (1958)
Smith, H. E., Pres. & Gen. Mgr., G. H. & H., Galveston, Tex. (1941)
Smith, J., B. & B. Supv., S. P., Sacramento, Calif. (1943)
Smith, L. D., Jr., Asst. Engr.-Bldgs., C. & O., Detroit, Mich. (1961)
Smith, L. L., Sr. Asst. B. & B. Supv., S. P., Dunsmuir, Calif. (1948)
Smith, R. H., Jr., Dist. Engr., P. R. R., Columbus, Ohio (1957)
Snyder, E. F., Asst. to Ch. Engr., I. C., Chicago, Ill. (1948)
South, J. E., Sys. Engr. Struc., P. R. R., Philadelphia, Pa. (1959)
Sparks, F. P., Asst. B. & B. Supv., N. Y. C., Mt. Carmel, Ill. (1954)
Spinks, W. H., Ch. Clk., C. M. St. P. & P., Chicago, Ill. (1959)
Spofford, F. R., Asst. to Vice Pres.-Oper., B. & M., Boston, Mass. (1940)
Sprengel, H. A., B. & B. Supv., M. P., Osawatomie, Kans. (1950)
Stadter, C. O., B. & B. Supv., M. P., Monroe, La. (1955)
Stanczyk, W., Detailer, C. M. St. P. & P., Chicago, Ill. (1957)
Starnes, W. B., Br. Insp., M. P., Kingsville, Tex. (1959)
Steel, J. V., Engr. Acct., U. T. Co., Dallas, Tex. (1953)
Stephens, B. M., Jr., Asst. to Exec. Vice Pres., T. & N. O., Houston, Tex. (1946)
Stephens, T. J., Engr. Insp., U. P., Kansas City, Mo. (1958)
Stillson, J., Gen. Fore.-Struc., P. R. R., Johnstown, Pa. (1959)
Stinebaugh, J. H., Supv. W. S. & Rdwy. Mach.. I. C., Carbondale, Ill. (1951)
Stumpff, G. A., Sr. Rodman, St. L. S. W., Pine Bluff, Ark. (1960)
Sturman, J. J., Dist. Br. Insp., B. & O., Baltimore, Md. (1959)
Stutes, S. A., Asst. Supv. Struc., T. & N. O., Houston, Tex. (1959)
Sullivan, P., Engr. Insp., W. P., Oroville, Calif. (1957)
Swanson, R. S., Asst. B. & B. Supv., N. P., Duluth, Minn. (1960)
Switzer, G., Gen. Supv. Struc. & Wk. Equip., W. P., Oakland, Calif. (1949)

T

Talman, H. S., Gen. Supv. B. & B., C. & O., Richmond, Va. (1956)
Tange, M., Engr. Acct., T. & N. O., Houston, Tex. (1959)
Tanner, C. L., Gen. Fore. B. & B.-W. S., P. & S. F., Slaton, Tex. (1958)
Tardy, F. E., Asst. Div. Engr., S. P., Tucson, Ariz. (1953)
Taylor, W. L., B. & B. Supv., Sou., Jasper, Ala. (1950)
Termunde, W. L., Asst. Rdm., B. Ry. of C., Chicago, Ill. (1956)
Tetreault, L. J., B. & B. Fore., N. Y. N. H. & H., Providence, R. I. (1936)
Thatcher, C. H., Jr., Asst. Engr., C. & N. W., Boone, Iowa (1958)
Thomas, A. A., Asst. to Ch. Engr., C. & N. W., Chicago, Ill. (1961)
Thomason, C. G., Bldg. Insp., M. P., Harlingen, Tex. (1956)
Thrasher, H. A., Asst. B. & B. Mast., C. N., Toronto, Ont., Can. (1957)
Throckmorton, W. B., Ch. Engr., C. R. I. & P., Chicago, Ill. (1957)
Tieman, L. G., Div. Engr., C. & N. W., Green Bay, Wis. (1956)
Tilley, E. L., Br. Insp., I. C., Memphis, Tenn. (1956)
Todd, D. C., Asst. Engr., P. R. R., Pittsburgh, Pa. (1942)
Toh, J. S., Br. Designer, M. P., St. Louis, Mo. (1956)
Towle, C. L., Ch. Engr., D. T. & I., Dearborn, Mich. (1959)
Tracy, D. E., B. & B. Supv., S. P., El Paso, Tex. (1956)
Tracy, S. E., Supt. Wk. Equip., C. B. & Q., Chicago, Ill. (1960)
Trenning, D. P., Drafts., C. M. St. P. & P., Chicago, Ill. (1959)
Trickey, R. E., Supt. B. & B., B. & A., Houlton, Me. (1957)
Trulove, J. D., B. & B. Supv., S. P., Ogden, Utah (1945)
Turner, G. M., Asst. B. & B. Supv., N. P., Pasco, Wash. (1960)
Tyckoson, E. G., Asst. Ch. Carp., C. M. St. P. & P., Chicago, Ill. (1954)
Tyler, W. R., Jr., Div. Engr., U. P., Pocatello, Ida. (1959)

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Urquides, E. L., Asst. B. & B. Supv., S. P., San Leandro, Calif. (1960)

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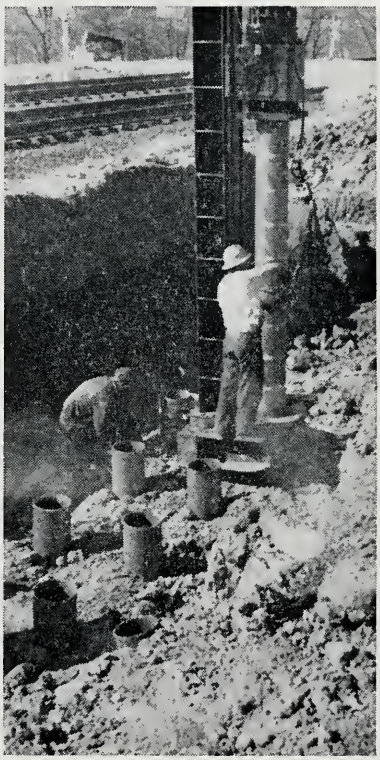

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V

Vanderpool, G. R., Br. Engr.-West. Lines, A. T. & S. F., Amarillo, Tex. (1959)
Vandiver, V. J., Asst. B. & B. Supv., S. P., Dunsmuir, Calif. (1958)
Van Ness, R. A., (Ret.), Br. Engr., A. T. & S. F., Sebring, Fla. (1949)
Van Scoyoc, L., Designer, I. C., Chicago, Ill. (1960)
Veldheer, H., Asst. Supv. B. & B., C. & O., Grand Rapids, Mich. (1959)
Von Behren, G., Asst. Supv. Struc., P. R. R., Baltimore, Md. (1956)
von Sprecken, R. E., Asst. Engr. M. of W., F. E. C., St. Augustine, Fla. (1951)

W

Wachtel, C. D., Asst. Engr., M. P., St. Louis 1, Mo. (1958)
Wachter, C. E., B. & B. Mast., C. N. R., Port Arthur, Ont., Canada (1957)
Wade, E. B., Asst. Div. Engr., T. & N. O., Houston, Tex. (1959)
Wagner, W. R., Div. Engr., C. & N. W., Green Bay, Wis. (1957)
Walker, D. L., Gen. Fore. B. & B.-W. S., St. L.-S. F., Springfield, Mo. (1959)
Walker, G. P., Supv. B. & B., M. P., Palestine, Tex. (1929)
Walker, P. W., B. & B. Supv., M. P., Nevada, Mo. (1959)
Walker, S. C., Supv. Struc., P. R. R., Philadelphia, Pa. (1958)
Wall, E. G., Div. Engr., G. M. & O., Bloomington, Ill. (1942)
Wall, R., Supv. B. & B., Sou., Selma, Ala. (1948)
Walsh, V. A., Jr., Drafts., C. & W. I.-Belt Ry. of Chi., Chicago, Ill. (1958)
Walton, K. D., Asst. B. & B. Supv., N. P., Minneapolis, Minn. (1960)
Walton, W. F., Gen. Fore. B. & B.-W. S., A. T. & S. F., Las Vegas, N. M. (1959)
Wang, A. B., Supv. B. & B., Monon, Lafayette, Ind. (1950)
Ware, W., Div. Engr., C. R. I. & P., Little Rock, Ark. (1956)
Warfield, H. Jr., (Ret.), Insp. M. of W., P. R. R., New Brunswick, N. J. (1952)
Warfield, W. B., Supv. Struc., P. R. R. - P. R. S. L., Camden, N. J. (1951)
Warren, J. A., Br. Insp., M. P., San Antonio, Tex. (1955)
Warrenfells, J. F., Ch. Engr., Jack. Term., Jacksonville, Fla. (1946)
Waterman, L. B., Engr. Maint. Equip., B. & O., Baltimore, Md. (1959)
Watkins, A. B., B. & B. Supv., Sou., Charleston, S. C. (1960)
Watkins, J. F., B. & B. Supv., Sou., Tuscumbia, Ala. (1958)
Watson, S. J., Ch. Drafts., C. & N. W., Chicago, Ill. (1961)
Weaver, W. R., Ch. Mech. Off. & Ch. Engr., P. & S., Brookville, Pa. (1951)
Webber, G. R., B. & B. Fore., C. M. St. P. & P., Tacoma, Wash. (1948)
Weeks, A. H., B. & B. Insp., N. Y. C., Watertown, N. Y. (1957)
Weikal, J. K., Asst. Div. Engr., E.-L., Hornell, N. Y. (1959)
Welch, J. W., Supv. B. & B., F. E. C., St. Augustine, Fla. (1943)
Welch, V. J., Prin. Asst. Engr., B. & A., Houlton, Me. (1958)
Weller, R. C., Div. Engr., C. N., London, Ont., Can. (1957)
Weyand, J., Drafts., U. P., Denver, Colo. (1958)
Wheeler, N. J., Design, Const. Engr., Monon., Lafayette, Ind. (1960)
White, L. H., Supv. B. & B., I. C., New Orleans, La. (1946)
White, R. D., Div. Engr., St. L. - S. F., Amory, Miss. (1959)
White, S., Gen. B. & B. Supv., S. P., San Francisco, Calif. (1946)
Wiemer, H. C., B. & B. Supv., N. P., Duluth, Minn. (1957)
Wiklund, W. W., Asst. Supv. B. & B., G. N., Havre, Mont. (1955)
Wilcoxson, W. D., Asst. Supvr. B. & B., L. & N., Covington, Ky. (1959)
Wilkin, R. L., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1959)
Williams, C., Asst. Supv. B. & B., C. & O., Ashland, Ky. (1950)
Williams, D. R., Br. Insp., C. & E. I., Danville, Ill. (1956)
Williams, J. B., Asst. Ch. Engr., S. I., Spokane, Wash. (1959)
Williams, J. R., Asst. Engr. Br., C. R. I. & P., Chicago, Ill. (1959)
Williams, L. L., B. & B. Supv., L. & N., Mobile, Ala. (1959)
Williams, N. H., Trk. Supv.-Sys., D. & H., Albany, N. Y. (1947)
Williams, W. T., B. & B. Supv., T. & N. O., Ennis, Texas (1956)
Williamson, H. M., Ch. Engr., S. P., San Francisco, Calif. (1960)
Wilson, H. E., Asst. Ch. Engr.-Sys., A. T. & S. F., Chicago, Ill. (1959)
Wilson, H. M., Supv. Struc., P. R. R., Chicago, Ill. (1953)
Wilson, R. P., Supv. B. & B., C. & O., Hinton, W. Va. (1948)
Winn, J. J., Div. Engr., B. & M., Concord, N. H. (1959)
Wintoniak, S. G., Supv. Struc., P. R. R., New York, N. Y. (1953)
Witherspoon, J. P., Mast. Carp., S. A. L., Savannah, Ga. (1948)
Wohlschlaeger, M. A., Asst. Engr., M. P., St. Louis, Mo. (1958)
Wold, O. R., B. & B. Supv., N. P., Spokane, Wash. (1957)
Wood, R. E., Supv. B. & B., G. N., Great Falls, Mont. (1954)
Woolford, F. R., Ch. Eng., W. P., San Francisco, Calif. (1950)

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Wright, R. J., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1960)

Y

Yaw, D. M., Mast. Carp., E.-L., Buffalo, N. Y. (1951)
Youngblood, R. A., Proc. Supt. B. & B., C. of G., Savannah, Ga. (1957)

Z

Zapfe, E. J., Asst. Ch. Engr. & Supt. B. & B., G. B. & W., Green Bay, Wis. (1952)
Zimmerman, C. B., Asst. Arch., Sou., Knoxville, Tenn. (1957)

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A

Anderson, A. (Ret.), Engr. Grade Cross., N. Y. C., Bear Creek Canon, Rosemont Route, Colorado Springs, Colo. 1947
Anderson, J. L. (Ret.), Supv. B. & B., M. P., 136 Pacific St., Osawatomie, Kans. 1931
Anderson, R. D., (Ret.), Div. Engr., C. & N. W., Marvin Hughitt Hotel, Huron, S. D. .. 1923

B

Batey, W. A. (Ret.), Const. Engr., U. P., 3853 Decatur St., Omaha, Nebr. 1918
Borchert, W. C. (Ret.), Div. Engr., L. & A., 917 Stephenson St., Shreveport 38, La. 1942
Bost, M. A., (Ret.) Asst. Engr., C. M. St. P. & P., 322 S. Carolina, Mason City, Iowa ... 1935
Brice, W. T., (Ret.), B. & B. Mast., C. N., General Delivery, Riverhurst, Sask., Can. 1946
Budzenski, F. N., (Ret.), Gen. Fore., C. & N. W., 800 Pine St., Antigo, Wis. 1938
Bunge, W. H. (Ret.), Asst. Engr., M. P., 4510 Waring, Houston 27, Texas 1941

C

Carothers, M. D., (Ret.), Asst. Ch. Engr., G. M. & O., 705 E. Washington, St., Bloomington, Ill. 1938
Carter, J. W. (Ret.), B. & B. Supv., Virginian, 2410 Brandon Ave., S. W., Roanoke, Va. 1947
Christianson, H. B., (Ret.), Spec. Engr., C. M. St. P. & P., P. O. Box 2500, Shelter Bay, Que., Can. 1928
Church, H. M., (Ret.), Gen. Supv. B. & B., C. & O., 509 No. Blvd., Richmond, Va. 1939
Colvin, A. A., (Ret.), Div. Engr., C. & N. W., 1000 Prospect Ave., Norfolk, Nebr. 1937
Converse, D. W., (Ret.), Br. Engr., A. C. & Y., 360 Litchfield Road, Akron, Ohio 1940
Cota, G. M., (Ret.), Ch. Clk. Engr. Dept., C. of V., Box 114, St. Albans, Vt. 1913
Cramer, F. H., (Ret.), Br. Engr., C. B. & Q., 2739 Agatite Ave., Chicago, Ill. 1927

D

Decker, H. H., (Ret.), Engr. of M., C. & N. W., 2915 Ingersoll Ave., Des Moines, Ia. . 1908
Dick, H. M., (Ret.), Supv. Struc., P. R. R., 302 Walnut Circle, Shiremanstown, Pa. 1942
Duchac, J. V. (Ret.), Supv. B. & B., C. & N. W., 525 Virginia St., Antigo, Wis. 1927

E

Eischenlaub, C. M. (Ret.), Supt., S. D. & A. E., San Diego, Calif. 1943
Engman, V. E., (Ret.), Ch. Carp., C. M. St. P. & P., 3429 - 17th Ave., So., Minneapolis 7, Minn. 1920

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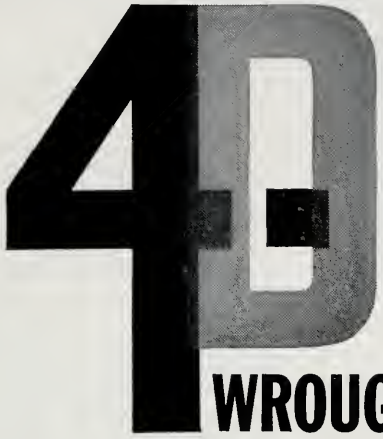

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Flanagan, F. L., (Ret.), Ry. Sls., Valspar Corp., Detroit Graphite Div., 7701 W. 47th St., Lyons, Ill. 1937

G

Geyer, C. J., (Ret.), Vice Pres., C. & O., 1412 Wilmington Ave., Richmond, Va. 1928
Gillette, J. E., (Ret.), Carp. Fore., C. M. St. P. & P., c/o Carp. Fore., C. M. St. P. & P. Mazomanie, Wis. 1923
Gillis, A. D., (Ret.), B. & B. Supv., N. Y. N. H. & H., 35 Grosvenor Ave., Providence 8, R. I. 1923
Glander, A. M., (Ret.), Ch. Carp., C. M. St. P. & P., 2008 Lake Shore Dr., Austin, Minn. 1936
Gunderson, E., (Ret.), Supt. B. & B., C. St. P. M. & O., Altoona, Wis. 1927
Guppy, B. W., (Ret.), Engr. Struc., B. & M., 52 Stratford Rd., Melrose, Mass. 1914

H

Hancock, J. S., (Ret.), Br. Engr., D. T. & I., 15360 Piedmont, Detroit, Mich. 1916
Hand, G. W., (Ret.), Asst. to Pres., C. & N. W., 412 Courtland Ave., Park Ridge, Ill. 1909
Harding, C. R., (Ret.), Pres., The Pullman Co., Route 4, Box 177, Easton, Md. 1924
Harman, W. C., (Ret.), Supv. B. & B., S. P., 656 Cedar St., San Carlos, Calif. 1911
Hartwell, J. R., (Ret.), Supv. B. & B., C. & N. W., c/o C. & N. W., Pierre, S. D. 1918
Heiszenbuttel, H., (Ret.), B. & B. Supv., C. & N. W., 808 So. 3rd St., Norfolk, Neb. 1917
Hemstad, B., (Ret.), Mast. Carp., G. N., 1120 Becker Ave., West, Willmar, Minn. 1937
Heuss, C. W., (Ret.), Supv. B. & B., C. C. C. & St. L., 2184 South Road, Pennfield, N. Y. 1919
Hillman, A. B., (Ret.), Ch. Engr., Belt Ry. of Chi.-C. & W. I., 7513 S. Carpenter St., Chicago 20, Ill. 1942
Hillman, F. W. (Ret.), Asst. Engr. M. of W., C. & N. W., 1106 N. Harlem Ave., River Forest, Ill. 1917
Huckstep, W. A., (Ret.), Gen. Bldg. Supv., M. P. 3126 E. Linden St., Tucson, Ariz. 1941
Huntsman, F. C., (Ret.), Asst. Engr., Wabash, 7421 Bruno Ave., St. Louis 17, Mo. 1922

J

Jackman, H. E., (Ret.), Mast. Carp., B. & O., 570 Eastern Ave., Chillicothe, Ohio 1944
Johnson, D. H. (Ret.), Supv. B. & B., C. St. P. M. & O., Eau Claire, Wis. 1940
Johnson, M. (Ret.), Prin. Asst. Engr., I. C., 5540 Hyde Park Blvd., Chicago 37, Ill. 1915
Johnson, R. W., (Ret.), Asst. Engr., C. M. St. P. & P., 1131 Ave. C., Yuma, Ariz. 1922
Jones, A. C. (Ret.), B. & B. Supv., Sou., Rt. 3, Box 1003, Birmingham 13, Ala. 1938

K

Kemmerer, W. G., (Ret.), Engr. B. & B., P. R. R., 508 Rockavon Rd., Narberth, Pa. 1931

L

Lacher, W. S., (Ret.), Secy., A. R. E. A., 407 E. Fuller Rd., Hinsdale, Ill. 1922
Lampson, W., (Ret.), Supv. B. & B., M. C., 170 Caleb St., Portland, Me. 1930
Landstrom, C. A., (Ret.), Supv. B. & B., C. B. & Q., 1311 S. 3rd St., Burlington, Ia. 1928
Larsen, H. C., (Ret.), Struc. Iron Fore., C. St. P. M. & O., 1084 Sims Ave., St. Paul 6, Minn. 1928
Lord, H. T., (Ret.), B. & B. Mast., C. P., 415 Third St., So., Kenora, Ont., Can. 1940
Luck, R. P., (Ret.), Drafts., C. & N. W., 2429 W. Farragut Ave., Chicago 25, Ill. 1920

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McKay, A. G., (Ret.), Supv. B. & B., N. Y. N. H. & H., 11 Pine Island Road, Jupiter Pt., Groton, Conn. 1915
McMahon, T. D., (Ret.), Arch., G. N., 223 Lake Avenue, White Bear Lake 10, Minn. . . . 1918

M

Madson, H. C., (Ret.), Design., C. & N. W., 1327 Curtiss Ave., Ames, Iowa 1940
Manley, B. F., (Ret.), Supv. B. & B., P. E., Los Angeles, Calif. 1916
Manning, D. A., (Ret.), Supv. B. & B., C. & N. W., 9120 Sherman Ave., Brookfield, Ill. 1939
Martens, W. F., (Ret.), Gen. Fore. B. & B., A. T. & S. F., 3396 Mayfield Ave., San Bernardino, Calif. 1924
Mateer, W. G. (Ret.), Mgr. Pur. & Stores, E. J. & E., 511 W. Jefferson St., Joliet, Ill. . . . 1944
Mead, E. L., (Ret.), Div. Engr., C. & N. W., 536 N. E. 69th St., Miami, Fla. 1923
Merwin, P. B., (Ret.), Asst. Engr., C. & N. W., Rte. 2, Box 565, Washougal, Wash. 1929
Mottier, C. H., (Ret.), Vice Pres., I. C., 135 East Eleventh Place, Chicago, Ill. 1942

N

Nies, A. B., (Ret.), Arch., N.Y.C. System, 408 Third St., Jackson, Mich. 1915

O

O'Brien, W. J., (Ret.), Dist. Carp., C.M.St.P. & P., Juneau County, Necedah, Wis. 1919
Oest, W. C. (Ret.), Prin. Asst. Engr., F. W. & D., Ft. Worth, Tex. 1947

P

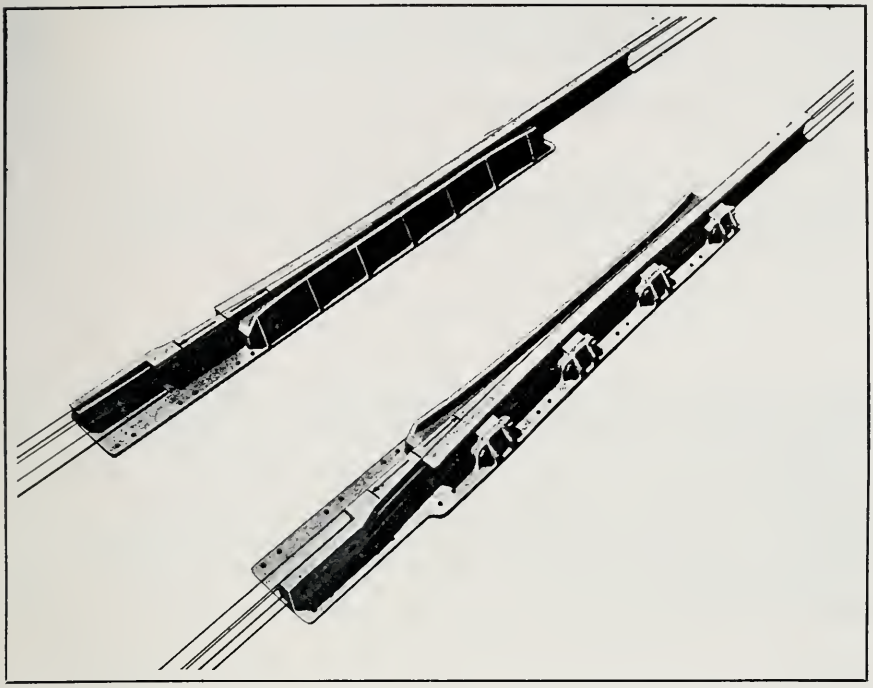
Parker, W. V., (Ret.), Gen. Fore. B. & B., St. L. S. W., R. R. #1, Box 122, Arlington, Tenn. 1911
Phillips, W. J., (Ret.), Asst. Gen. Br. Insp., S. P., 318 Arlington Ave., Berkeley, Calif. . . . 1925
Piccone, C., (Ret.), Br. Engr., Nat.Rys. of Mex., Monte Everest 210, Lomas de Chapultepec, Mexico City, Mex. 1923
Podas, N. F., (Ret.), Ch. Engr., St. P. U. D. Co. & M. R. Ry. Co., 1238 Randolph Ave., St. Paul 5, Minn. 1937

R

Reece, A. N., (Ret.), Asst. to Pres., K. C. S., 2808 Verde Vista Dr., Santa Barbara, Calif. 1922
Richards, C. A. J., (Ret.), Asst. Supv. Struc., P. R. R., 2717 Woodland Hills Ave., Lakeland, Fla. 1924
Rights, H. T., (Ret.), Asst. Br. Engr., L. V., 1015 Raymond Ave, Bethlehem, Pa. . . . 1927
Rintoul, D. T., (Ret.), Gen. Br. Insp., S. P., 2571 Glen Green, Hollywood 28, Calif. . . . 1910
Roof, W. R., (Ret.), Br. Engr., C. G. W., 7728 So. Yates Ave., Chicago 49, Ill. 1927
Rowland, O. F., (Ret.), Asst. Engr., D. & H., c/o Berkshire Industrial Farm, Canaan, N. Y. 1923

S

Scheetz, F. B., (Ret.), Asst. Engr., M. P., 3930 Connecticut Ave., N.W., Washington, D. C. 1905
Shobert, F. (Ret.), Sys. Steel Const. Fore., S. P., 2205 Manchester Drive, San Leandro, Calif. 1918
Singer, E. W., (Ret.), Supv. B. & B., N. Y. C. & St. L., 6727 3rd Ave. North, St. Petersburg, Fla. 1923
Smith, C. E., (Ret.), Vice Pres., N.Y. N.H. & H., 282 Prospect St., New Haven, Conn. . . . 1911
Swartz, W. G., (Ret.), Engr. Acct., C. N., Box 2115, R. R. #5, Victoria, B. C., Can. 1917



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Taggart, C. R., (Ret.), Supv. B. & B., N. Y. C., 514 N. Drexel Ave., Indianapolis, Ind. 1935
Tattershall, E. R., (Ret.), Supv. of Maint. Equip., N.Y.C., 21 Clay St., Malone, N. Y. 1913
Thelander, P. V. (Ret.), Asst. Ch. Engr., C. & N. W., 325 S. Batavia St., Batavia, Ill. 1939
Tourtellotte, E. B. (Ret.), Asst. Div. Engr., B. & M., Greenfield, Mass. 1947
Tucker, N. R., (Ret.), Asst. Div. Engr., T. & N. O., Houston, Tex. 1939

V

Varker, J. L., (Ret.), Spec. Engr., D. & H., 21 Archbald St., Carbondale, Pa. 1936
von Sprecken, T. M. (Ret.), Asst. to Ch. Engr.-Sys., Sou., 3845 N. Chesterbrook Rd., Arlington 7, Va. 1938

W

Walden, W. H., (Ret.), Rdm., Southern, 1012 Porter St., Richmond 24, Va. 1920
White, W. E., (Ret.), Gen. Fore., A. T. & S. F., 706 W. 6th St., Chanute, Kans. 1920
Whitehouse, B. M., (Ret.), Ch. Fire Insp., C. & N. W., 2008 Isabella St., Evanston, Ill. 1927
Winkelhaus, L. C., (Ret.), Arch. Engr., C. & N. W., 6921 Oriole Ave., Chicago 31, Ill. 1934
Wistrich, H. A. (Ret.), Ch. Engr., L. V., 1126 Main St., Bethlehem, Pa. 1938
Womeldorf, C. F., (Ret.), Div. Engr., C. & N.W., 111 No. 12th St., Norfolk, Nebr. 1917
Wray, H. O., (Ret.), Secy. & Ch. Engr., T. C. T., 511 Bay Street, P. O. Box 1054, Texas City, Tex. 1939
Wright, C. W., (Ret.), Mast. Carp., L.I., 67 Nassau Pkwy., Oceanside, N. Y. 1908

Y

Yewell, J. E., (Ret.), Ch. Engr., B. & L. E., 32 Second Ave., Greenville, Pa. 1941

Z

Zinsmeister, E. C., (Ret.), Mast. Carp., B. & O., 303 - 12th Ave. No., St. Petersburg, Fla. 1905

ASSOCIATE MEMBERS

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A

Agee, J. L., Mgr.-Steel Bldg. Sls., Armco Drainage & Metal Prod., Inc. P. O. Box 1699, Houston, Tex. 1957
Akers, R. H., RR. Sls. Mgr., Armco Drainage & Metal Prod., 1516 Keith Bldg., Cleveland 15, Ohio 1958

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Bell, C. R., Jr., (Partner) Quaker City R. R. Sls. Co., Philadelphia National Bank Bldg., Philadelphia 34, Pa. 1960
Bendall, T. L., Mgr., R. R. Herbicides, Agricultural Chem. Sls., The Dow Chemical Co., Midland, Mich. 1960
Berkel, C. J., Lee Turzillo Contracting Co., P. O. Box 9232, Kansas City 15, Mo. 1959
Biebel, W. A., Vice Pres., The Esbec Corp., 123 Louvain, Fairfield, Conn. 1961
Biggan, P. J., Slsman, W. E. Bugbee Ry. Equip. Co., 1803 Alamo National Bldg., San Antonio 5, Texas 1958
Bishop, D. B., Dist. Mgr., Dearborn Chemical Co., 2 Gateway Center, Pittsburgh 22, Pa. 1946
Blackford, W. A., Sls. Engr., Pettibone Mulliken Corp., 74 New Montgomery St., San Francisco, Calif. 1960
Bowman, G., Prod. Mgr., Ottowa Steel, 15050 Vaughn, Detroit 23, Mich. 1959
Brietzke, W. F., Mgr. R. R. Mach., Pettibone Mulliken Corp., 4710 W. Division St., Chicago 51, Ill. 1956
Brown, S. C., Adv. Mgr., American Hoist & Derrick Co., 63 S. Robert St., St. Paul 7, Minn. 1960
Bugbee, W. E., Sls. Rep., Ry. Equipment, 1803 Alamo National Bldg., San Antonio 5, Tex. 1956
Buskirk, G. C., Agricultural Sls. Dept., U. S. Borax & Chem. Corp., 4100 X St., Lincoln 4, Nebr. 1940

C

Carmichael, R. L., Dist. Sls. Mgr., R. R. Prod. Div., American Brake Shoe Co., 530 5th Ave., New York, N. Y. 1960
Carpenter, R. W., East. Sls. Mgr., True Temper Corp., 465 Woodmere Road, Berea, Ohio 1960
Cavins, K., Vice Pres., Fairmont Railway Motors, Inc., 332 S. Michigan Ave., Chicago, Ill. 1960
Comp, R. O., Jr., Sls. Mgr., Buckeye Iron & Brass Works, P. O. Box 883, Dayton 1, Ohio 1960
Cone, D. P., Pres., American Concrete Crosstie Corp., P. O. Box 11476, Tampa 10, Fla. 1960
Corporon, F. J., Comm. Rep., Motorola Comm. & Electronics Inc., 308 Earl Rd., Michigan City, Ind. 1950
Cox, E. W., Mgr. Ry. Sls., W. T. Cox Co.. 2200 W. 75th St., Kansas City 15, Mo. 1960
Crosby, R. C., Vice Pres., Kershaw Mfg. Co., P. O. Box 1711, Montgomery 1, Ala. 1961
Cross. E. T., Vice Pres., Armco Drainage & Metal Prod., Inc., Middletown, Ohio 1946
Cummins, C. P., Br. Engr., St. L. Co. Div. of Hiways, Clayton, Mo. 1948

D

Davidson, T., Asst. Mgr., Globe Chemical Company, 80 E. Jackson Blvd., Chicago. Ill. 1955
Davis, V. W., Mgr. R. R. Sls., Armco Drainage & Metal Prod., P. O. Box 1343, Atlanta, Ga. 1960
Denton, J. H., Sls. Engr., Southern Amiesite Asphalt Co., 3401 5th Ave., N., Birmingham, Ala. 1958
Detzel, G. E., Geo. E. Detzel Co., 1231 Draper St., Cincinnati 14, Ohio 1945
Deubel, H. R., Mgr. RR. Div., Chicago Pneumatic Tool Co., 936 E. 87th St., Chicago 19, Ill. 1956
Duffie, F. J., Engr. Serv. Repr., Linde Co., Oxweld R. R. Dept., 230 N. Michigan Ave., Chicago, Ill. 1946

E

Eaton, E. L., Dir. Fact. Rep., Strato-Tower Div., Young Spring & Wire, P. O. Box 103, Elkart, Ind. 1959
Eckert, F. L., Schramm. Inc., West Chester, Pa. 1958
Enstrom. W. A., Mgr. Trk. Mat'ls. Div., Pettibone Mulliken Corp., 4710 W. Division St. Chicago. Ill. 1956
Evans, R., R. R. Sls. Engr., Armco Drainage & Metal Prod., Inc., 20 N. Wacker Dr., Chicago 6, Ill. 1959
Evinger, F. W., R. R. Rep., The Leon Co., 3243 Euclid Ave., Apt. #2A, Berwyn, Ill. 1946

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Fechtner, O. R., Div. Prod. Mgr., Pettibone Mulliken Corp., 4710 W. Division St., Chicago 51, Ill. . . . 1956
Filkins, A. J., Pres., Filkins & Son Co., 299 N. Linden, Palatine, Ill. . . . 1927
Fletcher, R. L., Struct. Engr., Timber Engineering Co., 1319 18th St., N. W., Washington, D. C. . . . 1947
Flinn, L. E., Asst. Vice Pres. RR. Div., Dearborn Chemical Co., 375 Merchandise Mart, Chicago 54, Ill. . . . 1949
Flood, H. E., Sls. Prom. Mgr., Duff-Norton Co., P. O. Box 1998, Pittsburgh 30, Pa. . . . 1960
Frederick, H. Z., Mgr., Ry. Sls. Div., The R. C. Mahon Co., Detroit 34, Mich. . . . 1950

G

Gibboney, J. L., Vice Pres., Nat'l. Aluminate Corp., 422 No. Dover St., La Grange Park, Ill. . . . 1949
Giles, J. M., Spl. Rep., Off-Track Equip., Caterpillar Tractor Co., Peoria 8, Ill. . . . 1938
Gilhooley, T. E., S. E. Dist Mgr., Pettibone Mulliken Corp., 2232 Taylor Farm Rd., Lynchburg, Va. . . . 1960
Glassgold, I. L., Pres., Masonry Resur. & Con. Co., Inc., B. & O. Coal Pier, Baltimore, Md. . . . 1950
Grego, L. A., Sls. Engr. RR. Div., Pettibone Mulliken Corp., 141 W. Jackson Blvd., Chicago 4, Ill. . . . 1956
Gunther, E. C., Dist. Sls. Mgr., Duff Norton Co., 4937 W. Belmont Ave., Chicago 41, Ill. . . . 1960

H

Haarvei, O. A., Sls. Engr., Spider Staging Sls. & Serv. Co., 511 Fraces Ave., Loves Park, Ill. . . . 1958
Hansen, P. O., Ohio Sls. Mgr., Armco Drainage & Metal Prod., Inc., 1820 N. W. Boulevard, Columbus 15, Ohio . . . 1959
Henley, L. C., Sls. Rep., Dearborn Chemical Co., 375 Merchandise Mart, Chicago 54, Ill. . . . 1960
Hickey, J. F., Pres., Baker & Hickey Co., P. O. Box 5008, Tri-Village Sta., Columbus 12, Ohio . . . 1946
Higgs, J. A., Rep., The Queen City R. R. Constr. Inc., 1222 Clifton Rd., N. E., Atlanta 7, Ga. . . . 1959
Hoelzel, W. N., Asst. Vice Pres. Sls., Screw & Bolt Corp. of America, Gary Div., 122 S. Michigan Ave., Chicago 3, Ill. . . . 1949
Hofer, P., East Dist. Mgr., Pettibone Mulliken Corp., 350 Fifth Ave., New York 1, N. Y. . . . 1956
Hoffman, T. E., Factory Rep., Zone Co., 2502 Wilson St., Falls City, Nebr. . . . 1949
Hoglund, C. B., Lee Turzillo Contracting Co., P. O. Box 9232, Prairie Village, Kans. . . . 1959
Holmberg, V. V., Vice Pres., The Ellington Miller Co., 25 E. Jackson Blvd., Chicago 4, Ill. . . . 1942
Holmes, J. L., Rep., Bird & Son, Inc., 721 Second Ave., West Haven, Conn. . . . 1956
Holstein, F. W., Pres., Fred W. Holstein Co., Hopatcong, N. J. . . . 1948
Hopkins, W. S., Jr., Tech. Rep., Air Reduction Sales Co., 326 N. Broad St., Lititz, Pa. . . . 1949

I

Itter, R. C., Sls. Corresp., Pettibone Mulliken Corp., 4710 W. Division St., Chicago 51, Ill. . . . 1957

J

Jacobson, A. E., Serv. Engr., Linde Air Prod. Co., 230 N. Michigan Ave., Chicago, Ill. . . . 1950
Johnson, I. K., Const. Supt., Linnan Const. & Engr., Inc., 3958 N. 54th St., Milwaukee 16, Wis. . . . 1953
Johnson, S. C., Vice Pres.-R. R. Dept., Dearborn Chemical Co., Rm. 375 Merchandise Mart, Chicago 54, Ill. . . . 1960
Jones, E. L., Sls. Engr., American Crankshaft Co., 510 Morehead St., Charlotte, N. C. . . . 1957

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Kelly, R. J., Kelly System Inc., 422 N. Western Ave., Chicago, Ill. 1958
Khoury, T. N., Engrg. Rep., American-Marietta Co., 101 E. Ontario, Chicago, Ill. 1960
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Leff, L. J., Dept. Head, Pettibone Mulliken Corp., 4710 W. Division St., Chicago 51, Ill. 1960
Lehmkuhl, E. J., Sls. Mgr., Arcair Co., Lancaster, Ohio 1960
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Lynch, J. K., Dist. Sls. Mgr., Con. Prod. Div., American Marietta Co., 3431 - 27th Ave., No., P. O. Box 5563, No. Birmingham Sta., Birmingham 3, Ala. 1951
Lyon, C. A., Vice Pres., Nisso Master Builders Co., Ltd., New Ohtemachi Bldg., Chiyoda-ku, Tokyo, Japan 1945

Mc

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McGrath, F. E., Pres., Elder Trailer & Body, Inc., 4830 Race St., Denver 16, Colo. 1960
McMahon, R. D., Div. Mgr., Fabreeka Prod. Co., Inc., 15 St. Albans Circle, Newton Square, Pa. 1955

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Mains, W. W., Vice Pres., Armco Drainage & Metal Prod., Inc., P. O. Box 1699, Houston 1, Tex. 1960
Mann, E. A., Pres., Champion Transportation Sls., Inc., 222 W. Adams St., Chicago 6, Ill. 1951
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Maurere, S. S., West Div. Mgr., Fabreeka Products Co., 8137 Ridgeway, Skokie, Ill. 1952
Meyers, W. F., Engr. Mgr., Rockwell Standard Corp., 100 Clark St., Detroit 32, Mich. 1960
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Myers, D. R., Sls. Rep., R. R. Sls., Patterson Sargent Co., 1882 S. Normal Ave., Chicago 16, Ill. 1952

N

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Nicholson, L. P., Ry. Rep., Portland Cement Association, 33 W. Grand Ave., Chicago 10, Ill. 1958
Nuckols, L. T., Engr. Consult., % Greenbrier Hotel, White Sulphur Springs, W. Va. 1951

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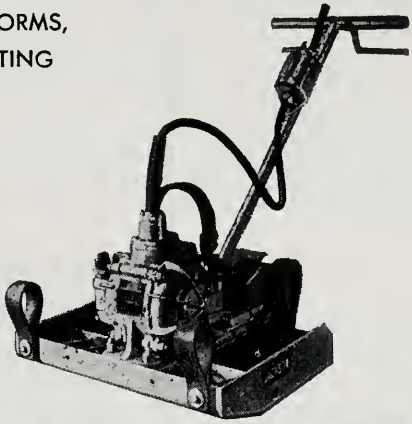

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Patterson, R., Const. Consult., 80 E. Jackson Blvd., Chicago 4, Ill. 1946
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Phillips, R. O., Asst. to Pres., The Zone Co., Fireplate Div., P. O. Box 789, Fort Worth, Texas 1956
Piepmeier, A. L., Vice Pres., Turner Engineering Co., 112 Union St., Nashville 3, Tenn. 1953
Pinnell, R. A., Jr., Pres., Lift Slab Research & Development, 8546 Broadway, San Antonio, Tex. 1959
Polk, P. W., Vice Pres. & Gen. Mgr., Buckeye Iron & Brass Works, P. O. Box 883, Dayton 1, Ohio 1960
Prugh, R. B., Sls. Develop. Mgr., Buckeye Iron & Brass Works, P. O. Box 883, Dayton 1, Ohio 1960

R

Reilly, W. C., Director Person. & Asst. Sls. Mgr., Conley Frog & Switch Co., 362 Bodley Ave., Memphis 9, Tenn. 1960
Roof, W. B., Const. Engr. & Asst. to R. R. Sls. Vice Pres., Armco Drainage & Metal Prod., Inc., Curtis St., Middletown, Ohio 1958
Ruhl, D. A., Prop. Engr., Joliet Arsenal, Joliet, Ill. 1948

S

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Scroggs, J. E., Mgr. R. R. Dept., Carter-Waters Corp., 2440 Pennway, Kansas City, Mo. 1958
Seppa, K. E., Sls. Engr., Armco Drainage & Metal Prod., 1320 S. W. Broadway Ave., Portland 1, Ore. 1960
Shipley, M. S., Pres., The Esbec Corp., P. O. Box 929, Stamford, Conn. 1960
Smith, C. E., Dist. Sls. Mgr., American Brake Shoe Co., 3318 W. 12th St., Houston, Tex. 1960
Smith, D. C., Sls. Mgr., Wood Pres. Div., Koppers Co., Inc., 750 Koppers Bldg., Pittsburgh 19, Pa. 1958
Sondag, G. W., Mgr. R. R. Sls. Armco Drainage & Metal Prod., Inc., 2180 Milvia St., Berkeley 4, Calif. 1960
Storer, J. W., Vice Pres., Osmose Wood Preserving Co., 1214 Regent St., Madison 5, Wis. 1961

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Truss, F. W., Mgr., RR. Sales, Armco Drainage & Metal Prod. Inc., 10 S. Brentwood Blvd., Clayton 5, Mo. 1946
Twomey, J. F., Vice Pres., McCracken Contracting Co., 7340 S. Western Ave., Chicago, Ill. 1956

V

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Von Kampen, K., Ch. Engr., Pettibone Mulliken Corp., 4710 W. Division St., Chicago 51, Ill. 1956

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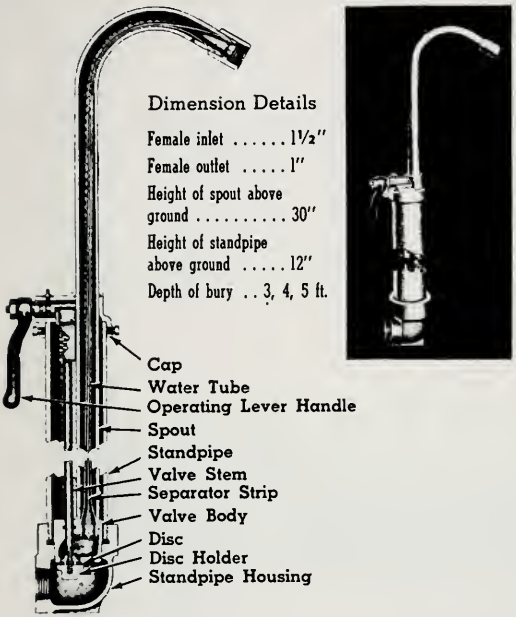
Dimension Details
Female inlet . . . . . 1½"
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Weiss, W. E., Sls. Engr., Pettibone Mulliken Corp., 4710 W. Division St., Chicago 51, Ill. 1956
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Wilson, W. C., Pres., Southeastern Ry. Supply, Inc., P. O. Box 368, Arlington 10, Va. .. 1951
Wingerson, C., Ry Sls. Engr., Screw & Bolt Corp. of America, P. O. Box 1708, Pittsburgh 30, Pa. 1954

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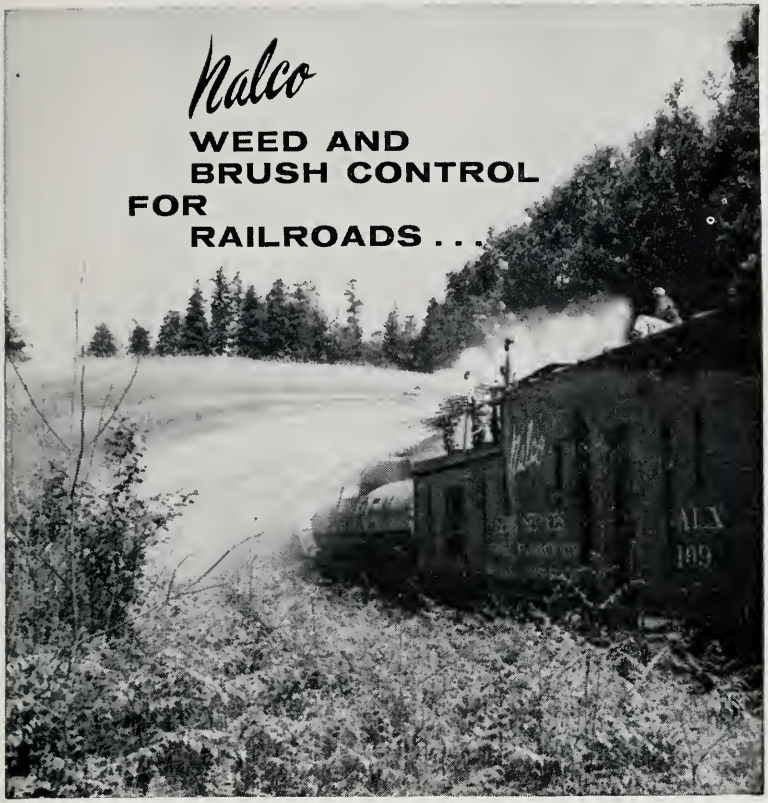

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